

8 INFRASTRUCTURE, PUBLIC UTILITIES & SERVICES

Infrastructure is the key determinant to the community which decide the functions towards their socio-economic development of the city. Facilitation of sustainable development the physical and social infrastructure are very much essential. Physical and social Infrastructure is the basic requirement which decides the quality of urban and rural life & overall productivity of the people. This chapter deals with the analysis of existing conditions of physical infrastructure such as Water Supply, Sewerage System, Solid Waste Management and Power as well as social infrastructure viz., Health and Educational facilities. Based on the analysis and clear understanding of existing scenario, future predicted the physical and social infrastructure for the projected year 2045.

In the formulation of Infrastructure plan, attention was given to the followings.

Emergency task is to directly respond to the basic needs of physical and social infrastructure both for the present communities and new settlement of the returnees.

Needs survey at the community level is a fundamental study for preparation of urgent rehabilitation and development programs for basic physical and social infrastructure. The plan is to be prepared as practicable and flexible one by staging the needs and level of services of basic infrastructure.

Institutional strengthening and capacity building will be carried out through actual planning and construction of the basic infrastructure, at the community, state government and Ground Operational Support System (GOSS) level.



Solid Waste Management Plant, Lekai Gaon, Dibrugarh

8.1 PHYSICAL INFRASTRUCTURE

Infrastructure is the basic physical structures needed for the operation of a society for an economy to function and physical networks that support society. Socio-economic growth of a town/city and the physical Infrastructure development in the town. Urban physical infrastructure (UPI) is one of the major assets of a city in terms of capital investment, critical services provisioning, and sustainable and resilient urban development. UPI includes physical objects like roads, sewerage, energy networks. Various data regarding details about amount of water supply, Hours of Supply, number of bore wells, details of sewerage system viz. capacity of STPs and details of drainage etc. have been procured from Public Health Division of PWD, Dibrugarh.

Dibrugarh Master Plan Area has the population of 3,61,397 (Census, 2011) and the population is projected to increase up to 551757 for the horizon year 2045. Therefore, in order to meet the future demand, calculation of the same for various sectors is necessary and the same is dealt with in this chapter.

8.1.1 WATER SUPPLY

Urban water supply infrastructure has often been designed with a focus on treatment and distribution and with only minimal consideration of source water characteristics. Sustainable urban water supply systems must link more closely with the natural water systems in which they are located. One of the important and essential resource of Water for the development any Region, saunter supply of the suffice the domestic, industrial and irrigation requirements within the planning area. Presently the planning area is influential on both part of ground and surface water sources to address the water requirements of the area. Due to the non-contiguous geomorphic nature of the planning area and for better management water supply within the planning area is divided into two, urban area and rural area.

8.1.1.1 Water Supply Scenario in Urban Area

water supply is one of the important infrastructure services for a city/town and a proper supply of water for its population ensures the city have strong basic infrastructure.

Presently, city does not have any performing water supply system, hence no household have piped drinking water connection. Under Central Government's AMRUT Scheme, water supply project is proposed within Dibrugarh Municipal Board area. The project details are as mentioned below in table 190.

8.1.1.2 Water supply scenario in rural areas

The water supply in rural areas within the planning area is managed by the Rural Water Supply System department. There is no provision of safe drinking water supply through pipelines and majority of the rural population is depending on various ground water sources. High percentages of population are depending hand pumps for water apart from community tube wells. There is no guarantee on the quality of these waters as the routine monitoring is rarely done. Further, proximity to safe drinking water sources is steadily decreasing towards rural areas, suggesting the need for providing more 'closer accesses'.

8.1.1.3 Ground Water Scenerio

Hydrogeology: Unconsolidated alluvial deposits of Quaternary Age covers major part of the region. Only about 4 % area of the region is underlain by semi consolidated formation of Tertiary Age belongs to Disang and Barail Groups of rock. A single system of aquifer (granular zone) below a thin clay cover on top is present mainly in the southern part. In the northern part, this single aquifer system is separated into a multiple aquifer system by thick clay partings. Thickness of aquifer increases from east to west. Ground water in the shallow aquifer group exists in unconfined to semi confined condition. In general depth of tube wells varies from 35 to 45 m. The tube wells constructed down to a depth of 50 m yields 27 to 45 m³/hour. Pre-monsoon depth to water level ranges from 0.16 to 4.23 m bgl. It is observed that Pre-monsoon depth to water level ranges from 2 to 4 m bgl in the southern part of the region and in a limited area in the northern part of the region.

8.1.1.4 Ground Water Quality:

Chemically, the water to be used for domestic purpose should preferably be soft, low in dissolved solids and free from poisonous constituents. Ground water of the region is colorless, odor-less and free from turbidity. Presence of TDS within 150 to 1000 ppm, SAR within 0.30 to 1.97, RSC value within 0.01 to 1.01 meq /lt and Fe content in most part of the district is below 5 ppm in ground water. But, towards Tengakhat area, concentration of iron is found more than permissible limit for drinking purpose. Moreover, goiter has been reported in some of the villages like Kalakhowa, Lejai and Sessa area which is due to deficiency of iodine in ground water. Thus, in general, the area is safe in all respect for utilizing of ground water. (Source: Central Ground Water Board, Ministry of Water Resource)

8.1.1.5 Area Traverse by Major River

Brahmaputra River: Flowing in the extreme North (flowing from NE to SW)

Sessa River: Flowing through the central part of the Borbaruah, flowing from NE to SW

Burhi Dihing River: Flowing in the southern boundary of the block, flowing from NE to SW

Mai Jan River: Flowing in the northern part of the Lahoal (flowing from East to West) Dibru River: Flowing from NE to SW and meets with Brahmaputra River in the West.

Table 190 Proposed Water supply scheme details at Dibrugarh MB Area

Sl. No.	Parameters	Details
1	RAW water	5.164km
2	Clear water	28.567km
3	water sources	Surface Water
4	Quantity of water supplied	48.2MLD
5	Sources of water supply	Brahmaputra river
6	Length of Distribution Network	224.14Km
7	Domestic House service connections	25691 nos.
8	Other Connections	300 nos. 15mm dia. multi-jet type AMR domestic water meter
9	Daily Duration	21Hours
10	No. of Connections metered	25691nos. 15mm dia. multi-jet type non AMR domestic water meter
11	Quantity treated (MLD)	40.6MLD

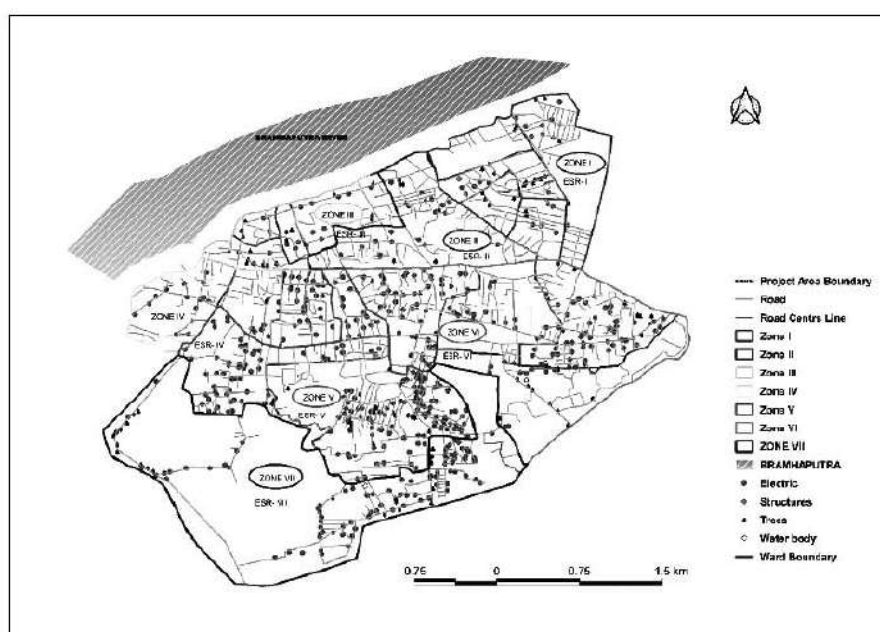


Figure 152 Water supply map of Dibrugarh

The map showing the boundary of the area covered by PWD for water supply is given in the next figure. Total water supplied quantities is 48.2 MLD and the main source of the water supply is Brahmaputra river. In here, domestic house service connections are 25691 nos and other connections are 300 nos.

8.1.1.6 Calculation of Future Demand Projections

In order to calculate the demand for a projected year, it has to be calculated for certain stages as per CPHEEO Manual. The four stages are mentioned below:

1. Intermediate Stage (20 years from the base year) - 2031
2. Ultimate stage demand (35 years from the base year) - 2045

The water supply demand should include the fire demand, institutional demand etc. as per the CPHEEO guideline. In order to calculate the demand, it is essential to calculate the projected population for the defined stages. The domestic water supply demand is taken as 135 lpcd. The Projected population considered for this project is as under

Table 191 Water Demand assessment for Water Supply Source & Rehabilitation System

Sl. No.	Particular	Population	Amount of Water supply (lpcd)	Total demand in MLD	Population	Amount of Water supply (lpcd)	Total demand in MLD
	Year	2011			2021		
1	Demand for existing population	361397	135	48.79	417572	135	56.37
2	Fire Demand $100 * ((\text{population}) / 1000^{1/2}) / 1000$			1.9			2.04
3	Unaccounted Water (15%)			7.6			8.76
4	Total Demand			58.29			67.17

Sl. No.	Particular	Population	Amount of Water supply (lpcd)	Total demand in MLD	Population	Amount of Water supply (lpcd)	Total demand in MLD
	Year	2031			2045		
1	Demand for existing population	470719	135	63.55	551757	135	74.49
2	Fire Demand $100 * ((\text{population}) / 1000^{1/2}) / 1000$			2.17			2.35
3	Unaccounted Water (15%)			9.86			11.53
4	Total Demand			75.58			88.37

8.1.1.7 Summary of Water Demand

Table 192 Summary of Water Demand for 2045

Sl. No.	Particulars	Particulars Demand for 2045
1	Total Projected Population for MPA	551757
2	Water Demand @ 135 lpcd for planning area in 2045	74.49 MLD
3	Fire Demand Unaccounted Water	$(2.35 + 11.53) = 13.88$
4	Total water Demand	88.37 MLD
5	Total water demand including Water loss @ 15% of water demand	13.25 MLD
6	WTP Capacity	101.62 MLD
7	Storage – GLSR @ 67% of WTP	68.09 MLD
8	Storage – ESR @ 33% of WTP	33.53 MLD

(Source: Compile by Consultant)

The water Demand of entire planning area for year 2045 will be around 88.37 MLD, including fire demand and 15% of water losses during water supply (Source: CPHEEO manual for water supply). In absence of water treatment plan in planning area, there is an urgent need of Water Treatment Plant. Additional GLSR & OHT storage requirement is to be provided considering the future requirements of year 2045 respectively 68.09 and 33.53. The capacity of OHT and GLSR are worked out based on the thumb rules set for calculating storage capacity.



8.1.1.8 Proposed Strategies

There is requirement of 88.37 MLD water to meet the drinking water demand of Dibrugarh Planning Area by horizon year 2045. As ground water potential of the area appears reasonably enough to support the drinking water needs, the present trend of relying solely on it may continue. But, apart from providing individual tube wells, a system of collector wells (cluster of tube wells) with an arrangement for treating the raw ground water is recommended for safe drinking water. Majority of the drinking water demand can be met using the surface/sub-surface flow of River Barahmaputra as a source of supply through collector wells/intake wells.

Action Plan

- Planning, design and implementation of a sustainable water supply scheme mainly based on surface/sub-surface/intake wells water supply from the river Brahmaputra and ground water
- Covering the entire planning area with a continuous water supply system assuring 24 hr supply with adequate pressure in the distribution system even at the tail ends
- Controlled use and management of ground water assuring treatment with disinfectants before distribution
- Public awareness against misuse of water
- Adequate reforms so as to balance the O&M cost with the revenue out of the water supply distribution.
- Conservation of natural water resources

For areas outside conurbation, respective Commune Panchayats will have to arrange for the water supply without hampering the environment.

Rainwater Harvesting

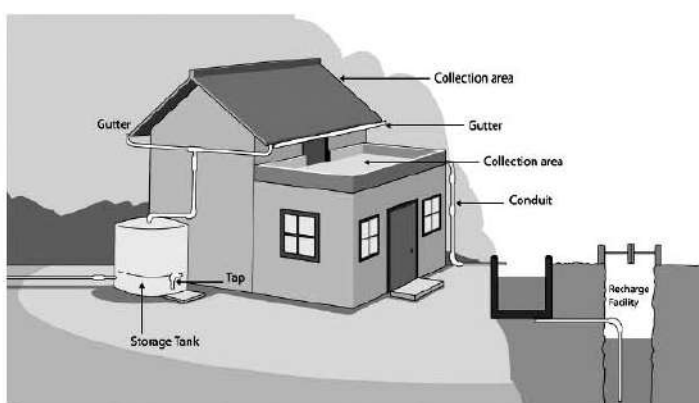
Rain water harvesting must be made mandatory in newly developed houses to increase ground water potentials.

Desilting of Tanks

The water tanks located outside conurbation area are recommended to undergo desilting process. This will increase the capacity of the tanks and ultimately lead to better ground water recharge.

Ground Water Recharging

As agricultural land is being converted to urban use, identifying sites for additional groundwater recharge is essential to keep water supplies balanced. The existing village tanks which are normally silted and damaged can be modified to serve as recharge structure. The village tanks can be converted into recharge structure. Several such tanks are available which can be modified for enhancing ground water. Construction of Percolation well is also an option for ground water recharge.



Recycling of Grey Water

Recycling of Grey Water is proposed for Car wash, landscaping, industrial cooling, flushing etc. Recycling of Grey Water should be promoted.

8.1.2 SEWERAGE SYSTEM

As at present, Dibrugarh does not have an integrated planned sewerage management system, and majority houses in the city have septic tanks, of which many are not maintained well; hence, overflowing and dysfunctional. In fact, many septic tanks are now non-functional because of the high water table, and as a result, much of the untreated wastewater directly flows into the storm water drains or into the natural drainage channels. It is a high time that the authority plan and implement proper public wastewater collection and disposal system to ensure that sewage or excreta and sludge discharged from communities is properly collected, transported, treated to the required degree and finally disposed off without causing any health or environmental problems.

As per the survey done, present wastewater generation by Dibrugarh town is approximately 166584 KLD but there is no STP provision done for sewerage generated by town.

Table 193 Sewerage Generation Calculation

Sl. No.	Area	Population	Water consumption (KLD)	Sewage generation (KLD)	No. of STPs proposed	Existing Treatment capacity (KLD)	Gaps in KLD
1	Dibrugarh	1,54,296	208230	166584	00	Nil	166584

(Source: Consultant Compilation)

8.1.2.1 Estimation of Wastewater Generation

The total water requirement for the Master Plan Area is 88.37 MLD (by the year 2045). As per CHPEEO guideline, 80% of total water demand is considered as the sewerage flow; therefore, around 70.70 MLD water is expected to go in sewerage lines. As time passes, the area is expected to grow and along with high water demand, there will be larger wastewater discharge; hence, the project area required systematic sewerage system so the wastewater will not be discharged in the natural drains, which will help in reducing the flood problem.

There should be underground sewerage connection to each households and from where the discharged wastewater should go to sewerage treatment plant before discharging it into the natural drains. While planning for the proposed sewerage system, consideration should be given to the natural drainage pattern. The sewerage system should be planned in such a way that there will be minimum pumping involved in collection and conveyance of sewage. New Sewerage Treatment Plant (STP) sites should be identified depending on considerations such as the quantum of environmentally suitable land, and availability of government land, capital and O&M cost of different options. While the underground sewerage is been planned and implement, the authority needs to make sure that each household in the region has a septic tank installed and is being managed and is fully functioned. Water from commercial and industrial activities wastewater is being treated before discharging in the river.

8.1.2.2 Issues

- **Absence of sewerage system:** there is absolute absence of sewerage system in Dibrugarh planning area resulting in discharge of un-treated waste water in drains and river Brahmaputra
- **Mixing of storm water and sewage:** In absence of sewerage and improper drainage system, in many parts of planning area, there is discharge of sewage into storm water drains and other water bodies
- **Maintenance of Septic Tank:** As per the present practice, the septic tanks are the only mode of disposal of sewage in Dibrugarh planning area, which are not frequently cleaned by the Dibrugarh Municipal Board.
- **Open Defecation:** Open defecation in slum area on river side banks and rural areas can be seen
- **Degradation of natural water bodies:** The disposal of waste water into drain and in other water bodies resulting degradation and contamination of water and land.

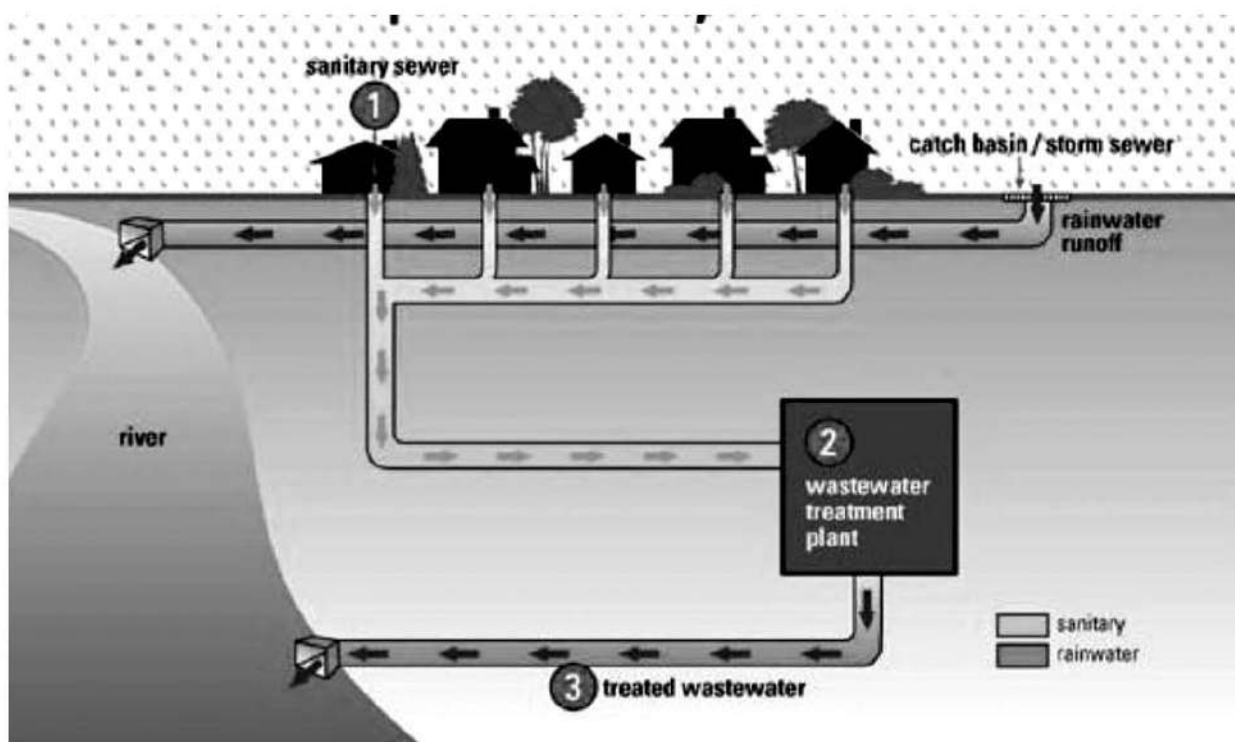
8.1.2.3 Proposed Strategies

In a modern society, proper management of wastewater is a necessity, not an option. A wide range of communicable diseases can be spread through elements of the environment by human and animal waste products, if not disposed properly. The development of effective water and wastewater treatment methods has virtually eliminated major water borne epidemics in developed countries.

Developing countries like ours, where treated water is not available to a majority of the population, still experience epidemics like cholera and typhoid. It is also to be mentioned that as per the report of the Planning Commission for the Tenth Five Year Plan, which emphasizes that all cities, towns and industrial areas should compulsorily have sewage treatment plants and are to be implemented in a time bound manner. Advanced waste water treatment process is currently being so developed that it will produce palatable water from domestic wastewater.

Recommendations

- For treatment of waste water generated from the planning area, a decentralized wastewater treatment system would be more appropriate. The centralized sewage treatment system appears inappropriate as it may end up with very huge sizes of sewers and various issues of conveyance in handling this huge quantity of wastewater.
- The treatment plants and sewers are to be so aligned as to reduce the number of crossings with railway tracks and National Highways of the area. The proximities of natural drains for treated effluent disposal, minimum obstructions for laying sewers, and the possibilities of acquiring land for sewage treatment plants (STPs) turns important in orienting and locating the plants.
- The possibilities of re-use of treated wastewater effluent for irrigation, gardening etc. should be looked into.
- The construction of treatment plants could be carried out in a phased manner on a modular/zonal basis in the planning area consistent with the future development/demand.



8.1.3 STORM WATER DRAINAGE SYSTEM

The terrain of the Planning Area is almost flat with an elevation varying from 55mt to 38mt from Upper North-East region of DMPA area to Western region. Rajabhetha Jan and DTP are forming the two main drainage basins. Dibrugarh Town Protection (DTP) drain and Second Main Drain are manmade constructed drains. In DMPA, due to the absence of underground storm water drainage system, open drains are existing along the roads. This drain carry water from kitchens as well as rainwater. The water from these channels goes to the bigger channels and ultimately discharges it into the Brahmaputra River.

The Assam Urban Infrastructure Investment Program is a key urban infrastructure initiative of the Government of Assam. The investment program aims to provide improved access to water supply, sanitation and urban infrastructure facilities to the urban population in Dibrugarh. The project uses a multi tranche financing facility (MFF) modality and, requires the preparation of a Resettlement Framework and Resettlement Plan for all subprojects under the Program. The major outputs of this program include improved drainage in Dibrugarh to reduce economic losses due to flooding, and comprehensive SWM. The Plan states infrastructure bottlenecks and lack of long-term funds for infrastructure investment, is one of the main constraints for growth.

The project components include improvements of drains which will reduce flooding in Dibrugarh town. It includes all major drains of the town, including the DTP drain and key lateral drains for improvement. The Dibrugarh drainage subproject covers (i) sludge removal from the bottom of the existing drain; (ii) widening and construction of 9.515 km of reinforced cement concrete (RCC) drain linings; (iii) construction of a 0.386-km diversion channel in two stretches; (iv) demolition of existing narrow culverts and replacement with 8 m-wide new box culverts; (v) construction of a 16-m bridge on the national highway; (vi) demolition of an old narrow sluice gate and construction of a new, wider sluice gate with 10 gates; (vii) provision of fencing along drain sides at road crossings; (viii) provision of slab covers on both sides of the culverts and foot bridges; and (ix) provision of 10 RCC foot bridges.

The benefits would be improved environmental and living conditions and public health in Dibrugarh. In addition, the economic benefits considered due to the proposed project are: (i) reduction of household healthcare cost due to flooding and water logging problems; (ii) reduction in person-days lost due to water logging and flooding; (iii) reduction in temporary resettlement cost due to flooding; (iv) reduction in annual cost of protection measures from flooding; (v) reduction in annual agricultural loss; and (vi) reduction in road maintenance cost.

Desilting of the DTP drain will have to be carried out from the downstream end. Widening and construction of the 9.515-km RCC drain is necessary because: (i) due to favourable climatic conditions, vegetation growth in the drain is quick, and reduces the flow velocity; and (ii) since the soil of the Dibrugarh is alluvial, it is highly susceptible to rainwater erosion, so the runoff is always sediment laden. Lining the drains will increase flow velocity and conveyance of the channel. A key component of this subproject entails widening and construction of the 9.5-km RCC drain in the town section of Dibrugarh, which would entail permanent impacts on private structures located along the drains as well as some temporary impacts during subproject construction. All construction/widening activities of the DTP drainage is being carried out on the existing channel and adjoining government land.

Table 194 Storm water Drainage parameters

SI. No.	Drains	Length of Drain (metre)	Percentage(%)
1	DTP Drain	9515 m	-
2	Rajabhetha Jan Drain	2955 m	-
3	Covered RCC Drain	26452 m	-
4	Second Main Drain	9392 m	26.90
5	Kachha Drain	21923 m	62.75
6	RCC Drains under Progress	3617 m	10.35
Total Length		34,932 m	100

(Source: T&CP and Dibrugarh Municipal Board)

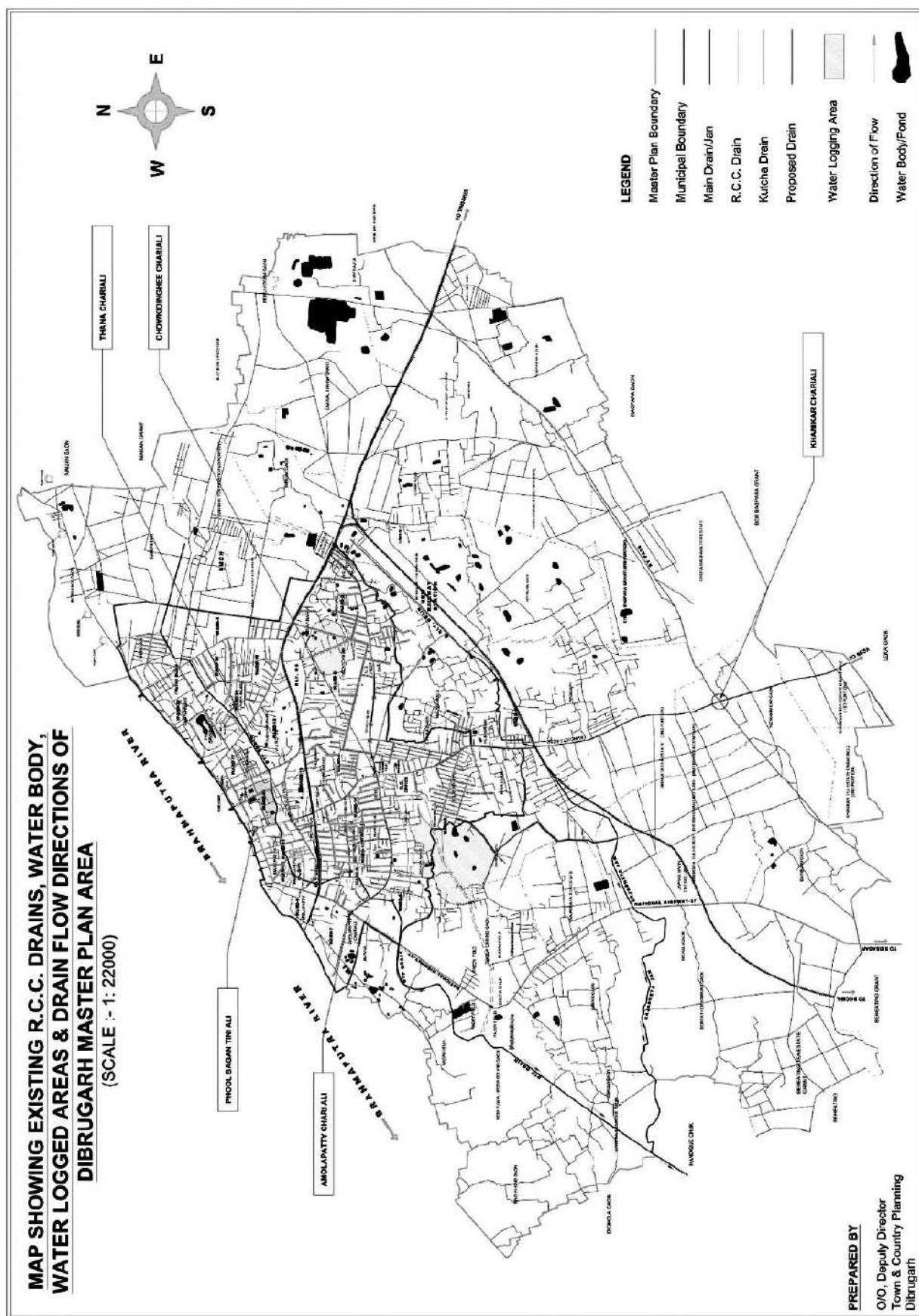


Figure 153 Storm Water drainage within MPA

Issues and Requirement**8.1.3.1 Open Channel Area:**

- Closed channel water drainages are observed on many streets within municipal board where some streets are under progress.
- Unhygienic condition due to open channel leads to spread of diseases.
- It also leads to high health risk due to illegal discharge of wastewaters and solid waste.
- Another issue includes foul odour source establishment and becomes a breeding ground for insects and pests.
- Regular cleaning service is not done to remove solids from the open channel area which increases the chances of blockages which can cause spill-over and flooding.
- Open channel areas are differentiated into 3 parts and the locations are mentioned below:
 - Drainage block area: Sajid store to Viridi Automobiles shop, along AT Road (length of 110 meters), M/S. DP Groups Battery Store to Kamakhya Pan Shop along Convey Road (length of 370 meters), All India Radio Station and its opposite side along Convey Road (length of 10 meters).
 - Open drainage system: Near Asha Medical to State Bank ATM along Mancotta Road (length of 220 meters), Indian Oil petrol pump to Public High School along AT Road (length of 330 meters), All India Radio Station and its opposite side along Convey Road (length of 40 meters), G.M Hospital to Radha Krishna Mandir along AMC Road (length of 310 meters).
 - Drainage under construction: Near TV service centre to X junction of University Link Road, Durgadin Road and Convey Road (length of 210 meters).
- The locations of open drainages are marked with major width along roadside



8.1.3.2 Flood Prone Areas:

- Many low-lying areas are found under water logging within the city area.
- Due to absence of storm water drain, the rainwater and the flash water, in monsoon, are unable to flow down stream and due to this the area becomes prone to water logging.
- At many places, the accessibility on pavement hinders due to presence of water logging end hence sometimes become a reason for traffic congestion.
- The water logged areas include Mancotta and NH-37 T junction to Civil Defence Office; near Office of The Divisional Forest Officer to cross junction of NH 37 (AT Road) and Red crossroad; cross junction of Jail Road and NH 37(AT Road) to Dibrugarh Hospital (civil hospital).

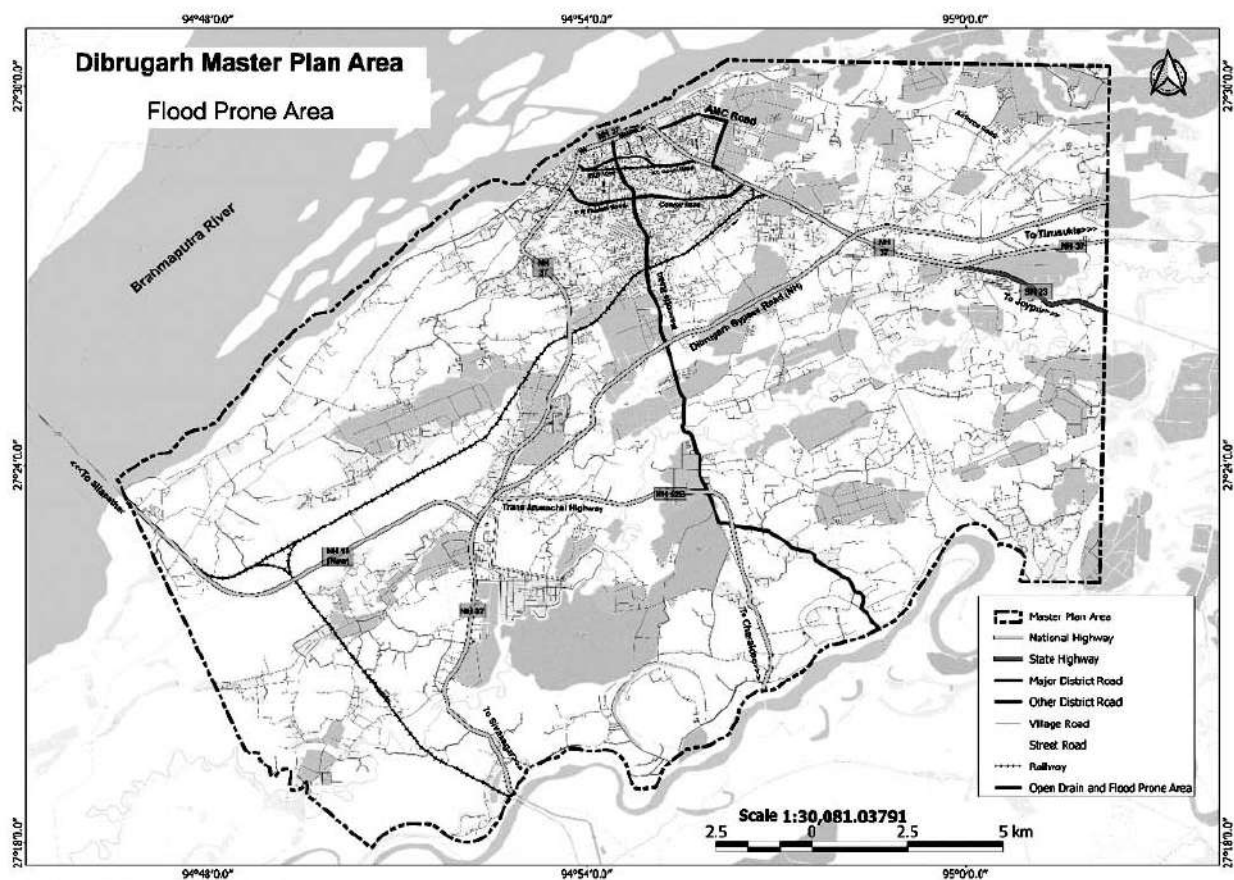


Figure 154 Open channel and flood prone areas



8.1.3.3 Proposed Strategies

A separate storm water drainage network has been proposed in the development area for the collection and safe disposal of storm water during rainfall. The design criteria to be followed for design of Storm Water Drainage network are broadly based on the recommendations as laid down in the CPHEEO Manual of Sewerage and Sewage Treatment, Ministry of Urban Development, Government of India and as per provisions laid down in the relevant I.S. Codes and Consultants' past experience in related field.

- Rectification of slope and width of drains shall be done, wherever required.
- Provision of new storm water drainage network as per phase wise requirements worked out considering key parameters of precipitation intensity, catchment delineation, percolation characteristics and surface runoff.
- Existing drains which can be used as storm water drains, need to be upgraded based on engineering aspects & runoff calculation.

Recommendations

- The lack of proper sanitation and solid waste management, combined with indiscriminate dumping of solid waste in the drains reduces the carrying capacity of these natural drains. The implementation of a systematic solid waste and wastewater collection and treatment system is a necessary prerequisite for proper drainage of the area.
- The natural drains have been encroached upon and are almost in dilapidated state. Also, at many reaches the drain sidewalls are found to be damaged. The section of the drain is also irregular and less adequate at many locations. Proper gradient is not maintained at several stretches on its reach and the hydraulic parameters are also not uniform. Also, no definite drain section is maintained in many reaches. So, proper maintenance and management of the existing natural drains turns important. This necessitates a proper evaluation of the existing natural drainage system.
- Over the years the River Brahmaputra has progressively silted up due to which the flood water flows at ever higher levels than the water levels in this main drain.
- The natural depressions and ponds, which were instrumental in preventing excess storm run-off, are getting filled up at a rapid rate due to urbanization. This may further aggravate the existing problem of water logging. It is necessary that 'natural sinks' be retained as such as, they are instrumental in controlling the water logging of the area.
- An organized drainage system is invariably associated with the implementation of a systematic solid waste and wastewater collection and treatment system.
- Periodic de-silting of the existing storm water drains should be done.
- Perimeter protection of all the major drains should be checked before every rainy season.
- Overall, the preparation and implementation of a master drainage plan appears essential for Dibrugarh planning area
- All roads of the town/city should have side-drains, which will serve as minor or tertiary drains
- Existing drains which can be used as storm water drains, need to be upgraded based on engineering aspects & runoff calculation

8.1.4 SOLID WASTE MANAGEMENT

At present, Solid waste management is one of the major challenges the cities of India are facing. Dibrugarh is the district where first solid waste management project in Assam has been inaugurated recently in August 2021 at Lekai in the Thakurthan area on the outskirts of Dibrugarh. Since a long time, the residents had been facing a lot of problems due to the unavailability of proper garbage disposal unit.

Earlier, garbage and waste materials were dumped in the Maijan area near river Brahmaputra in Dibrugarh, causing pollution to the entire area. Hence, due to this, the Dibrugarh and Lahowal MLAs have come up with the project proposal in 2017 and it was successfully implemented by 2021.

Assam Urban Infrastructure Investment Program (AUIIP), Government of Assam is a key urban infrastructure initiative of the Government of Assam and aims to improve the urban environment and quality of life in the city of Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), and drainage infrastructure. The major outputs of this Program include comprehensive SWM Plant in Dibrugarh. The project which recognizes infrastructure bottlenecks and lack of long-term funds for infrastructure investment as the binding constraint for achieving its goals. The project is built at a cost of Rs 75.03 crore on a 28.3-hectare plot of land under the Assam Urban Infrastructure Investment Program (AUIIP). It has a capacity to convert 100 metric tonnes per day (TPD) of waste into compost. Additionally, diesel, granules and plastics can also be produced from the plant.

Around 90 metric tonnes of solid waste is being produced by the 22 municipal wards of the town every day. Until now, these wastes were dumped in an unscientific manner at the Maijan ghat along the Brahmaputra river flowing beside Dibrugarh town.



8.1.4.1 Solid Waste Management in Urban Areas*Table 195 Ward wise Solid waste collection, 2020*

Wards	Average generating (Tons/day)	Average collection (Tons/day)	No. of Houses covered for House to House Collection	Total Area Used for Sanitary Land Fill (hac)	Manpower deployed	No. of Sites used for Land Fill
1	4.4	4.3	471	29 hectare land is presently utilized for performing solid waste treatment at newly built Lekai SWTP.	2	1 (Lekai Gaon, SWTP)
2	12.9	12.8	1352		8	
3	4.3	4.2	618		2	
4	4.1	3.9	1625		2	
5	3.5	3.3	1086		2	
6	8.5	8.3	1370		4	
7	2.3	2	715		4	
8	4.2	4	1054		4	
9	2.2	2	556		2	
10	2.5	2.2	488		4	
11	5.2	4.9	763		2	
12	2.7	2.4	779		2	
13	2	1.69	712		2	
14	4.7	4.5	767		2	
15	2.4	2.2	986		4	
16	3.8	3.6	696		3	
17	3.7	3.6	690		4	
18	6.2	6.1	1145		2	
19	5.2	5	1119		2	
20	4.3	4.1	608		2	
21	3.5	3.3	900		4	
22	7.3	7.2	1229		5	

(Source: Dibrugarh Municipal Board) 2020

Presently, the solid waste generation in DMB area as per Govt. record is 99 MT/Day whereas collection is 95.59 MT/Day as per Municipal Board record. Out of total collected waste, 20 MT found degradable, 30 MT as Biodegradable and 10 MT as Hospital Waste. No. of household covered in door-to-door waste collection are 11395 as per Municipal Board record. Vehicle deployed in Solid waste collection system are 31 Trippers, 7 Tractor, 112 Tricycles and 3 Dumper. Manpower deployed to run entire system are 14 Sanitary Supervisors and 64 rag pickers.

Citizens have habit of throwing garbage on streets, into the open drains, in the backyards, and in the open spaces. This section proposes explains the foreseen solid waste generation and the management for the same in the project area.

8.1.4.2 Quantity of Waste Generated

The quantity of MSW generated depends on numerous factors such as population, food habits, standard of living, degree of commercial activities and seasons. The increasing urbanization and changing lifestyles have increased the waste generation rate of Indian cities.

Criteria for assessing waste generation

- Projected populations for the design period
- Existing per-capita waste
- Annual rate of increase of per capita waste generation

8.1.4.3 Solid Waste Demand Projection

For urban area, per Capita Waste Generation for 2015 is taken as 400 gms. As given in the DPR for MSW Disposal through Incineration Process, it is assumed that per Capita Waste generation rate increases at a rate of 1.4 percent annually. Hence per capita waste generation for 2045 is 568 gms.

Table 196 Future assessment of Solid waste Generation

Sr. No.	Particulars	Demand for 2045
1	Projected Population	551757
2	Solid Waste Generation (in Conurbation area @568 gms/cap/day)	313.39 MT

(Source: Compiled by Consultant)

8.1.4.4 Issues in Present System

Lack of Primary Collection System

Solid waste is discharged by establishment into open plots, open drains etc. these un-organized disposal methods have resulted in the accumulation of solid waste on roadsides, vacant plots, and storm water drains. This has resulted in a number of hygiene related problems such as breeding of flies/ mosquitoes and stray animals.

Un-hygienically Solid Waste Transportation

Municipal Solid Waste is transported primarily in open vehicles i.e. trucks, tippers and cycle rickshaw. It is also observed that these modes of transportations are overloaded with MSW, resulting in the littering of roads during transportation. The loading and unloading of waste are carried out manually, and Safai Karamcharis involved in these activities do not use any safety measures.

In-sufficient collection and disposal of construction waste

The construction and demolition waste generated by residents is transported in tractor trolleys and disposed at either secondary collection points or open/low-lying areas in the town vicinity.

Handling of MSW with Slaughter Waste

Waste from the slaughters houses is disposed in open dumping sites, although there are provisions for separately disposing slaughter house waste in Dibrugarh town / planning area.

Disposed of Bio-medical waste without any treatment

Presently, there is no treatment facility available for bio-medical waste in Dibrugarh and Medical waste is disposed off along with general MSW.

Lack of primary Collection points

Unattended waste lying in open areas is common phenomena in the entire town because of non-availability of required numbers of bins in the planning area.

Multiple Handling of Wastes

The waste is handled multiple times leading to potential health hazards for the workers as all types of wastes contains hospital waste, human waste etc are disposed in the same containers.

Lack of Awareness

There is absolute lack of awareness among people w.r.t. handling and management of waste.

8.1.4.5 Proposed Strategies**Decentralized Solid Waste Treatment System:**

The developmental pattern of all the areas, especially Dibrugarh, demands the implementation of an integrated solid waste treatment system. It is felt that only a decentralized MSW Management System could help solve the seemingly intricate problem of solid waste treatment in this area in an economically viable, socially desirable and environmentally sound manner.

Public Participation:

General environmental awareness and information on health risks due to improper solid waste management are important factors which need to be continuously communicated to all sectors of the population. Building awareness among public and community about the need for a better solid waste management system is as essential as management. Public awareness and attitudes to waste can affect the people's willingness to cooperate and participate in adequate waste management practices. If people keep on throwing waste on the streets indiscriminately, the local body alone cannot keep the city clean in spite of their best efforts. Thus, it is very important to make people understand that the treatment and management of solid waste is a collective responsibility of the local authority and the community. Municipalities or local governments through participatory programs should convey this message to the people.

Collection Enhancement facilities:

- Old dustbins are to be replaced with different types of covered dustbins, which reduces the time of pickup and improves the process of primary collection of wastes.
- Sweepers may be provided with handcarts and detachable containers and be allotted a fixed area or number of houses for door to door collection. They should also be provided with safety gears and proper uniforms.
- It can be made compulsory for the management of societies/complexes to keep covered bins in which waste is to be stored at acceptable locations, to be picked up by the municipal staff.
- The local body may collect waste from community bins by using container handcarts or tricycles whichever may be convenient, for transferring the wastes to the waste storage sites by employing municipality sweepers.
- The collection service can be provided on a full-cost recovery basis using contractor services on a day-to-day basis from individual houses.
- The collection service can be provided on a full-cost recovery basis using contractor services on a day-to-day basis from individual shops also. The service of rag pickers and part-time sweepers can also be used in agreement with the shop owners.

- Sweeping of all public roads, streets, and lanes, by-lanes where there is habitation or commercial activities on either side of the street should be done daily. A list of such streets and roads together with their length and width should be prepared. The local body, keeping in view the norms of work prescribed should work out a program for their daily cleaning. However, roads and streets where there is no habitation around and do not require daily cleaning may be put in a separate group.

Provision of Solid waste Storage:

One of the immediate measures to revamp the existing collection services structure would involve provision of covered community waste bins at proper distances for the people to deposit domestic waste. This is the first step that will ensure that people do not throw their garbage on the roads and hence do not create open dump sites. This will enable the sanitation workers to transfer waste to the transportation vehicle quickly and efficiently with minimum health risk which will also help to maintain the aesthetics of the surroundings.

The Municipal Solid Waste (Management and Handling) Rules 2016 of the Government of India have prescribed the compliance criteria for waste storage depots as under:

- Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users.
- Storage facilities to be set up by municipal authorities or any other agencies shall be so designed that waste stored are not exposed to open atmosphere and shall be aesthetically acceptable and userfriendly.
- Storage facilities or "bins" shall have "easy to operate" design for handling, transfer and transportation of waste. Bins for storage of biodegradable waste shall be painted green, those of recyclable waste shall be painted white and those of other wastes shall be painted black.
- Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers. So, the storage and handling of SW are extremely important, and hence the steps to be taken by the Municipal authorities for storage of solid wastes are detailed in table below:

Segregation:

These compositional characteristics of the solid waste underline the need for proper segregation before treatment. Proper segregation of waste into different components and their separate collection can definitely lead to remarkable changes in the entire system.

The segregation of the waste would be a long drawn exercise as it involves attitudinal changes in people and will have to be done with careful planning, in a phased manner. The general public is to be first sensitized towards the whole concept and educated about the need and advantages of doing the segregation. Segregation of waste at the source itself is extremely important as municipal solid waste, which is otherwise environmentally benign on getting mixed with hazardous waste like paints, dyes, batteries, and human excreta turns hazardous. The recyclables like paper and plastic etc. become unsuitable for recycling as these get soiled by the organic matter.

Although, it would be more fruitful to sort and place different kinds of recyclables in separate receptacles, the waste could be segregated into at least two categories of biodegradable and non-biodegradable initially.

The recyclables obtained through segregation could be straightway transported to recycling units which in turn would pay certain amount to the corporations, thereby adding to their income.

Table 197 Solid waste Generation Source

Sl.No.	Generation Source	Action Proposed
1	Residential	<ul style="list-style-type: none"> Keep food waste / biodegradable waste in a non corrosive bin type – D1 Not to throw any waste in neighborhoods, on streets, open space, and vacant lands, in drains or water bodies. Keep dry/ recyclable waste in bin type – D2 Keep hazardous waste separately
2	Multistoried buildings, commercial complexes, private societies	<ul style="list-style-type: none"> 1 to 4 as above. Provide separate bin type – B large enough to hold wastes generated both biodegradable and recyclable. Direct member of the association / society to deposits waste in bins provided. Sanitary inspectors should vigil the area and fines should be imposed for not following the actions
3	Slums	1 to 4 as above. Use bin type –C
4	Shops, offices, Institutions	1 to 4 as above. Store the waste in bin type – D1, D2
5	Hotels and restaurant	1 to 4 as above They should arrange their own bins and dispose waste in nearby municipal bins.
6	Vegetable, fruit markets, meat, fish markets, and street Vendors.	<ul style="list-style-type: none"> Keep small baskets with them and transfer waste to large bin type-A. Shop keepers not to dispose of the waste in front of their waste or shops or open space. Deposit waste as and when generated into bin type-A. Fines should be imposed for not following the action
7	Marriage halls, Community halls, Kalyan Mondaps.	1 to 4 as above. Provide a large bin type –B
8	Garden Waste	Compost the waste in garden itself, if possible. Store wastes in large bags or bins and transfers it to community bins.
Note: Bin Type A (volume 7 m³), Type B (0.75 m³), Type C (0.5 m³), Type D1 and Type D2 (12 liters)		

This would help in formalizing the existing informal set up of recycling units, and this formalization in turn could lead to multi-advantages. The biodegradable matter could be disposed off either by aerobic composting, anaerobic digestion or sanitary land filling. Depending upon land availability and financial resources, either of these disposal methods could be adopted. Though simple land filling is the traditionally practiced system of solid waste management in the planning area, aerobic composting by wind-row method will be an appropriate option. All the nonbiodegradable waste which is non-recyclable, non-reusable shall be dumped into sanitary land fill. Biodegradable waste shall be subjected to composting. Area required for composting shall include the area for storage of unprocessed material, processing facilities for composting operation and storage for green compost.

The area required for windrow composting with 15 days composting period with moisture content between 55-60% for aerobic composting, the first turning shall be done at the 4th day and thereafter every third day shall be 1.5 acres to 2 acres per 50 MT per day waste.

Reuse and Recycling:

The concepts of reuse and recycling can well be applied in solid waste management as solid waste is basically a heterogeneous mixture. In typical Indian municipal solid wastes, there is a small percentage of recyclable material and more of compostable and inert materials like ash and road dust. There is a very large informal sector of rag pickers, who can collect recyclable wastes (paper, plastic, metal, glass, rubber, etc) from the streets, bins and disposal sites for their livelihood. Thus, the rag pickers can be effectively used for the collection of reusable materials especially because the use of non recyclable packaging materials like PET bottles for soft drinks, mineral wastes, and soft -foam products and metalized plastic film coated food

packing materials are on the rise. During recycling, many of these release toxic gases and ozone depleting products. So it is advisable to educate people to replace these items with eco-friendly packaging materials. The desirable home sorting mechanisms includes dry recyclable materials (e.g. glass, paper, plastic, cans etc.), kitchen and garden wastes, bulky wastes, hazardous wastes, construction and demolition wastes. Sorting can also be done just prior to waste processing or land filling.

Energy from Solid Waste:

Electricity can be produced by burning MSW as a fuel. MSW power plants, also called waste-to-energy (WTE) plants, are designed to dispose of MSW and to produce electricity as a byproduct of the incinerator operation. Mass Burn is the most common waste-to-energy technology, in which MSW is combusted directly in much the same way as fossil fuels are used in other direct combustion technologies. Burning MSW converts water to steam to drive a turbine connected to an electricity generator. Burning MSW can generate energy while reducing the volume of waste by up to 90 percent, an environmental benefit. However, this burning MSW in WTE plants produces comparatively high carbon dioxide emissions, a contributor to global climate change. The net climate change impact of these emissions is lessened because a major component of trash is wood, paper and food wastes that would decompose if not burned. If left to decompose in a solid waste landfill, the material produces methane, a potent greenhouse gas. The concept of producing energy from MSW derives significance as it is given high priority by the Ministry of Non-Conventional Energy Sources (MNES), Government of India.

Treatment options:

The biodegradable portion of the waste is considerably high. So, aerobic composting of SW after proper segregation will be more appropriate. In selected locations especially in rural areas, Vermi-Composting can also be recommended. The manure obtained by these methods can be sold to the local public as fertilizer. Though costly, sanitary land filling can also be practiced at selected urban locations where the recovery from the waste will be very high, serving minimum ecological damage. It appears that the aerobic composting by Windrow method may be a desirable option for the management of the solid waste. The possibilities of generating energy from SW could be looked into on an experimental basis.

Biomedical wastes and its management:

Biomedical waste has been a growing concern because of the awareness in public regarding HIV, AIDS and Hepatitis B and exposure to discarded needles, syringes and other medical waste from municipal garbage bins and disposal sites. The management of biomedical waste turns important as it has serious bearing on the quality of human life. This becomes more significant especially in the context of the recent trend of establishing multispecialty hospitals in urban centers. Biomedical waste can be regarded as any waste generated during the diagnosis, treatment or immunization of human beings or animals or produced due to activities of biological research, human anatomical waste, animal waste, microbiology and biotechnology waste, waste sharps, discarded medicines and cytotoxic drugs, solid wastes, liquid waste, incineration ash, chemical waste, etc. Medical wastes contain pathological waste (such as human tissues such as limbs, organs, fetuses, blood and other body fluids), infectious waste (soiled surgical dressing, swab material in contact with persons or animals suffering from infectious diseases, waste from isolation wards, cultures or stocks of infectious agents from laboratory, dialysis equipment, apparatus and disposable gowns, aprons, gloves, towels, etc.), sharps (any item that can cut or puncture such as needles, scalpels, blades, saws, nails, broken glass, etc.), pharmaceutical waste (drugs, vaccines, cytotoxic drugs and chemicals returned from wards, outdated drugs, etc.), chemical waste (any discarded solid, liquid or gaseous chemicals from laboratories, cleaning and disinfection) etc.

Implementation of Bio-medical Wastes (Management and Handling) Rules, 1998

The Ministry of Environment and Forests issued the Bio-medical Wastes (Management and Handling) Rules, 1998 which were amended subsequently. These rules provide for segregation, packaging, transportation, storage, treatment and disposal of wastes generated by hospitals, clinics and laboratories. Bio-medical wastes (BMW) have been classified into various categories and the treatment and disposal options for each of the categories are specified. The treatment and disposal should be in compliance with the standards prescribed in Schedule V, which stipulates standards for incinerators (operating and emission standards), for waste autoclaving, for liquid waste, of microwaving and for deep burial. A schedule for implementation of BMW rules has been laid down in Schedule VI. Imposing segregated practices within hospitals to separate biological and chemical hazardous wastes that will result in a clean solid waste stream, which can be recycled easily. An Advisory Committee is to advise the prescribed authority on the implementation of these Bio-medical wastes (Management and Handling) Rules.

8.1.4.6 Processing and Disposal of Solid Waste

The solid waste can be processed by composting, vermi-composting, anaerobic digestion, sanitary land filling, incineration or any other biological processing for stabilization of wastes. Since it contains a high amount of biodegradable portion, composting may be a cost-effective option for processing. The process of microbial composting or vermi-composting may be adopted with least mechanization to keep the cost low, and to market the compost as fertilizers to adjoining villages. So the concerned municipalities are duty bound to earmark required acres of land to meet the requirement of solid waste treatment. The areas of existing dumping yards can also be developed. The rejects from these plants and domestic hazardous wastes may be carefully landfilled. The bio-medical wastes may be disposed off as per the Bio-Medical Waste Management and Handling Rules as described above.

A decentralized treatment system will be more feasible option for solid waste treatment. In combination with primary waste collection, composting improves the precarious waste situation in the communities, and residents become less dependent on the poor municipal waste collection service. Decentralized composting can be operated by an appropriate technology and implemented at reduced investment and operating costs. Manual composting in small, decentralized plants is more easily integrated in the prevailing level of development in India and the socio-economic background, as it requires labour-intensive processes. It will create employment opportunities and a source of income to the underprivileged people in the rural Dibrugarh. Decentralized composting allows reuse of organic waste where it is generated, thereby reducing waste quantities to be transported as well as transport costs. This may drastically reduce the overall cost of municipal solid waste treatment.

8.1.4.7 Proposals for Solid Waste Treatment

The solid waste generation expected in Dibrugarh Planning Area by 2045 is very high, providing compost treatment facilities for this huge quantum of wastes, though essential, may not be practically possible in a single phase. So, it is necessary to propose economically feasible and, technically viable solutions which can be implemented in a phased manner. The densely populated urban areas of DMPA are to be given first priority in providing the composting facilities for solid waste treatment. The area required for solid waste treatment and disposal facilities will be 8 hectares.

8.1.4.8 Disposal of Hazardous Waste

The Notification from the Government of India, Ministry of Environment dated 20th July 1998, which deals with the collection of Bio-Medical Wastes entrusts the liability of its disposal with the waste producer itself. Thus, the management of bio-medical waste is not the responsibility of Municipalities. But, however, they can assist in the management of biomedical wastes on a full cost recovery basis without sharing any legal responsibilities. It is advisable to have bio-medical facility for the entire Dibrugarh Planning Area. The bio-

medical wastes collected from spots can be stored in selective transfer stations and can be transported to this central treatment facility at village Lekai. If so desired, the authorities can formulate an action plan for implementing this plant through some competent agencies and can suitably charge for the treatment and disposal of bio-medical wastes. The solid waste dumping sites closest to industrial sites will be a more appropriate option.

8.1.5 ELECTRIC SUB-STATION AND MAJOR TRANSFORMERS

8.1.5.1 Power Grid of Dibrugarh Master plan Area

The present power demand of the district including that of the three regions of Dibrugarh, West Revenue Circle and East Revenue and area. The demand is normally under these schemes NERPSIP, IPDS, and UDAY Scheme (Installation of Smart Meter). There are 3 numbers of sub – divisions under Dibrugarh Electrical Division. The sub divisions are : 1) Dibrugarh Elect. Sub-Div-I (West Revenue Circle), 2) Dibrugarh Elect. Sub-Div-II (East Revenue Circle) and 3) Dibrugarh Elect. Sub-Div-III (Dibrugarh Municipality Board Area) At present there is no shortage in meeting the requirements of the present demand in any of the three regions. Source from Assam Electricity Grid Corporation Ltd the electricity is Namrup Thermal power station.

Table 198 Energy Supply in Dibrugarh town

Sr. No.	Particulars	Details
1	Demand for energy	60 MW Peak Demand
2	Annually or monthly supply of power	Average 22.9 MU per Month
3	Numbers of metered connections	96292 Nos

(Source: APDCL, Dibrugarh)

Table 199 Annual or Monthly Supply of Power of Dibrugarh

Type of Consumer	Demand (mw)	Supply (mw)
Residential	28.71	28.71
Government	4.61	4.61
Social and Institutional	0.01	0.01
Commercial	9.5	9.5
Industrial	16.75	16.75
Agriculture	0.02	0.02

(Source: APDCL, Dibrugarh)

8.1.5.2 Power Supply Demand Projection

The actual demand in 2011 was 99.02MW. the power demand for 2045 is calculated by assuming 2.74 kWh per capita per day considering domestic, commercial, industrial and other requirements as per URDPFI guidelines 2015. The power demand for the 2045 will be 151.1 MW.

Table 200 Power Demand for 2045

Sr. No.	Particulars	Demand		
		2021	2031	2045
1	Projected Population	417572	470719	551757
2	Power Requirement @2.74 kWh per capita per day	114.41MW	128.98MW	151.18MW

(Source: Compiled by Consultant)

Power demand – 2.74 kWh per capita per day considering domestic, commercial, industrial and other requirements as per URDPFI guidelines 2015

As per the population 2021 for Dibrugarh Master Plan Area, the Power Demand is 114.41 MW considering 2.74 kwh per capita per day. The Power Requirement for 2045 will be 151.18 MW. Even if the possibility of use renewable energy is to be explored and promoted. The strategies are proposed below:

8.1.5.3 Proposed Strategies

- There are various other sources, such as Wind energy and solar energy for generating power which is required to be explored.
- Additional solar energy to be sold to public grid/ electricity authority.
- Sector-wise power demand needs should be worked out which will be helpful in proper planning & estimating future power requirement.
- Incorporation of Renewal Power Obligations (RPO) in building byelaws (applicable to major building projects >20,000 sq.ft.)
- Tax concession on material and appliances procured for renewable energy products.



8.2 SOCIAL INFRASTRUCTURE

Social infrastructure plays an important role to provide quality of life to the residents of the city. The effectiveness of social infrastructure in achieving the objective of city development plan would depend upon its capacity to contribute to improvement in the quality of life, enhanced self-dependency and city's sustainability. The level of social infrastructure shall aim the creation of liveable city through reducing the sense of alienation among the residents with less dependence on other settlements for basic infrastructure.

Social infrastructure refers to the facilities and mechanisms that ensure education, health care, community development, and social security, recreational and social welfare. The development cannot be looked at in isolation without considering the basic needs of the people, and a significant level of investment is needed in this sector. Usually this development referred to as the commitment towards realizing the vision of the city.

8.2.1 EDUCATION

Education is an important factor influencing the quality of life of the people and future development of an area. It empowers them with skills and knowledge and helps them to better lead their life and to access best of the employment opportunities available in the market. This in turn will impact the work force participation rate and economy of the area.

8.2.1.1 Educational Facilities in Pre-Primary & Secondary Education

The existing scenario of Primary, Middle school and Higher secondary school for the Dibrugarh area is shown in the table given below:

Table 201 No. of Pre-primary Schools to Secondary Schools of Dibrugarh Master Plan Area

Sl. No.	Description	Number
1	Pre-Primary Schools	142
2	Primary School	71
3	Higher Secondary School	48

(Source: Inspector of School, 2020)



Figure 155 Dibrugarh Primary and Higher Secondary school Planning area

8.2.1.2 Educational Facilities in Higher Education

The existing scenario of university, Art/Science/Commerce colleges and professional colleges for the Dibrugarh area is shown in the table given below:

Table 202 No. of Higher Educational Institutes

Sl. No.	Description	Number
1	University	1
2	Engineering Collage	1
3	Art/Science/Commerce Colleges	11
4	Polytechnic	1
5	S.D Sahewalla Memorial School of Nursing	1
6	Medical Collage	1
7	ITI	2

In order to provide adequate educational facilities and infrastructure all through the planning area, it can be proposed as setting up these facilities on a hierarchical basis i.e. at City Level (Planning Area), at Planning Unit Level, at Neighborhood Level and lastly at Residential Area level.

For instance, higher order facilities like college, integrated schools, school for handicapped are to be provided at the master plane level while facilities like Nursery and primary schools are to be provided at the Neighborhood level.



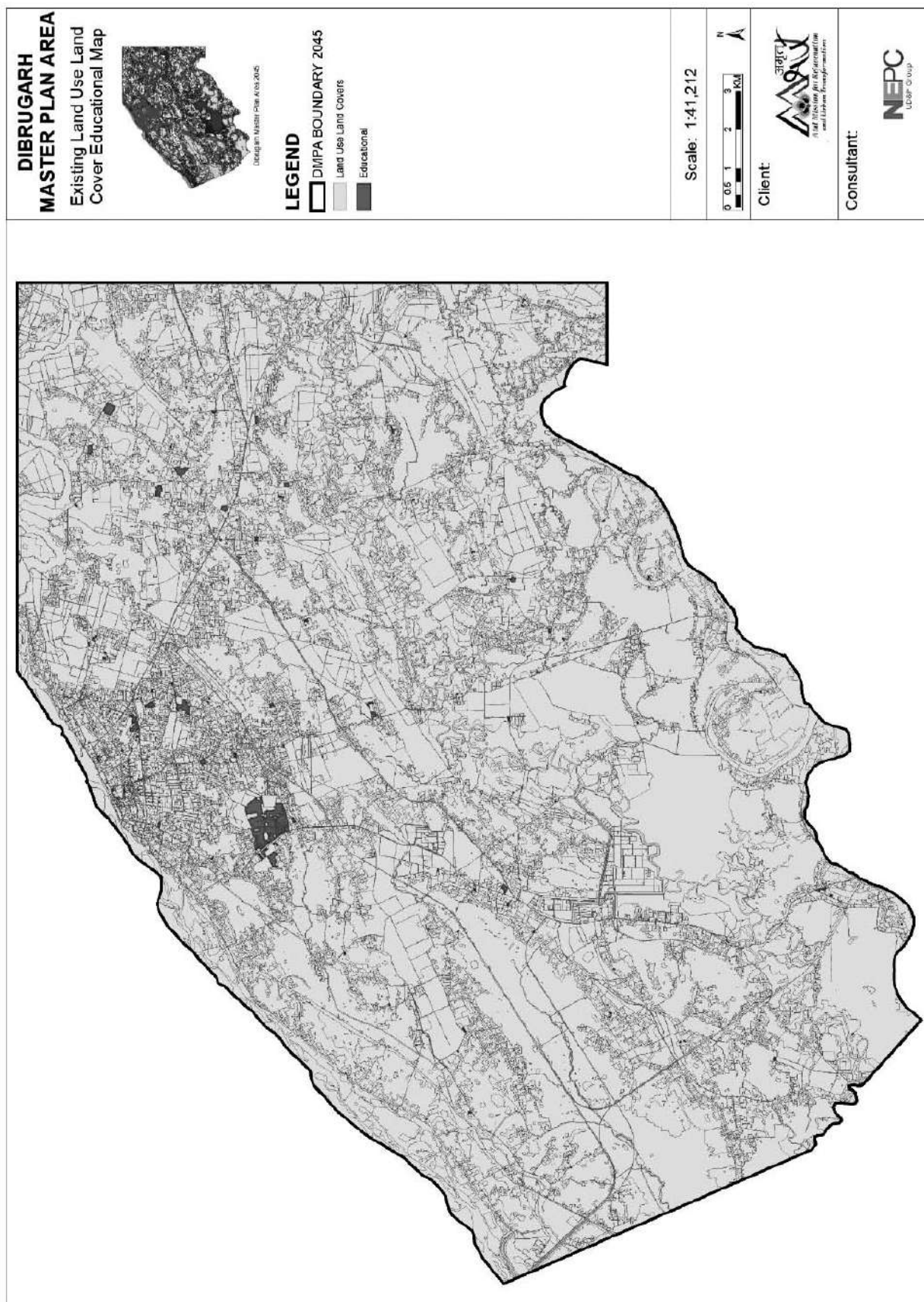
Dibrugarh Hanumanbax Surajmall Kanoi College



DSK Commerce College, Kanoi College



Dibrugarh University



8.2.1.3 Educational Facility Demand Projection

Table 203 Demand-Supply Gap Assessment of Educational Facilities: School Level

Existing Scenario					Land Requirement as per Future Need													
Sl. No.	Particular	Indicator Unit	Current Level (2011)	Current Gap	Desired Level as per URDPFI guideline	Short Term			Medium Term		Long Term			Land Requirement as per Future Need				
						2021		2031		2045		Short Term			Medium Term		Long Term	
						Demand	Gap	Demand	Gap	Demand	Gap	2021		2031		2045		
1.	Population		361397		417572			470719		551757		Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)	
2.	School																	
	Pre-Primary, Nursery School		142	2		2500	167	25	188	21	220	32		25	2	21	1.68	32
	Primary School (Class I - V)		71	1	5000	83	12	94	11	110	16		12	4.8	11	4.4	16	6.4
	Senior Secondary School (VI - XII)		48	0	7500	56	8	62	6	73	11		8	14.4	6	10.8	11	19.8
	Integrated School without hostel facility (I - XII)		0	0	100000	4	4	5	1	6	1		4	14	1	3.5	1	3.5
	Integrated School with hostel facility (I - XII)		0	0	100000	4	4	5	1	6	1		4	15.6	1	3.9	1	3.9
	School for physically challenged		-		450000	1	1	1	0	2	1		1	0.70	-	-	1	0.70
	School for Mentally channelled		-	0	100000	-	-	-	-	1	1		-	-	-	-	1	0.20

Table 204 Demand-Supply Gap Assessment of Educational Facilities: College level

Existing Scenario					Short Term				Medium Term		Long Term			Land Requirement as per Future Need					
Sl. No.	Particular	Indicator Unit (number)	Current Level (2011)	Current Gap	Desired Level as per URDPFI guideline	2021		2031		2045		Area Requir e (Ha)	Short Term		Medium Term		Long Term		
						Deman d	Gap	Dema nd	Gap	Dema nd	Gap		2021	Gap	Total Area Requi re (Ha)	Gap	Total Area Requi re (Ha)	2045	Total Area Requir e (Ha)
						41757 2		4707 19		55175 7				0	5 Ha	0	0	0	0
1.	Populat ion		361397																
2.	Collage																		
		College	11	0	125000	4	0	4	0	5	0		5 Ha	0	0	0	0	0	
		University Campus	1	0	1000000	-	-	-	-	-	-	10 to 60Ha		-	-	-	-	-	
		ITI's/Vocati onal Training	2	0	1000000	-	-	-	-	-	-	4 Ha		-	-	-	-	-	
		Polytechnic	1	0	1000000	-	-	-	-	-	-	4 Ha		-	-	-	-	-	
		Engineering College	1	0	1000000	-	-	-	-	-	-	6 Ha		-	-	-	-	-	
		Medical College	1	1	1000000	-	-	-	-	-	-	15 Ha		-	-	-	-	-	
		Other Professiona l Colleges	-	1	1000000	-	-	-	-	-	-	2 Ha		-	-	-	1	2.00	
		Nursing and Paramedica l Institute	1	0	1000000	-	-	-	-	-	-	2000 sqm		-	-	-	-	-	

8.2.1.4 Summary of Educational Facilities Requirement

The demand of various Educational Facilities for the year 2045 is mentioned below in the table 207. The calculations are done based on URDPFI Guidelines

Table 205 Demand of Educational Facilities & Land Requirement for 2045

Sl. No.	Particular	Demand in 2045	Land required in 2045 (Ha)
1	Pre-Primary, Nursery School	220	6.24
2	Primary School (Class I - V)	110	15.6
3	Senior Secondary School (VI - XII)	73	45
4	Integrated School without hostel facility (I - XII)	6	21
5	Integrated School with hostel facility (I - XII)	6	23.4
6	School for physically challenged	2	1.4
7	College	6	0
8	University Campus	1	0
9	ITIs/Vocational Training	1	0
10	Polytechnic	1	0
11	Engineering College	1	0
12	Medical College	1	0
13	Other Professional Colleges	1	2
14	Nursing and Paramedical Institute	1	0

(Source: Compiled by Consultant)

Based on the area requirement for each unit, land requirement for the above mentioned educational facilities is worked out. There will be a need of 114.64 Ha. of land for the above mentioned educational facilities.

8.2.1.5 Proposed Strategies

- As the process of Educational department recruitment should be consolidated to make sure only highly skilled teachers are recruited.
- More infrastructural facilities like public library, laboratory, and computers should be provided to schools to enhance the pupil's learning.
- There is a need to set up more schools in villages and outgrowths of the planning area to improve the people's access to educational facilities.
- Welfare for the differently-abled children should be given due emphasis by setting up special learning schools for them.
- Special emphasis should be laid on technical and skill based vocational education.
- More jobs oriented vocational courses should be introduced by utilizing the existing infrastructure facilities of polytechnic institutions.
- Keeping in view, the influence zone of Dibrugarh, it is suggested that more emphasis should be laid on professional education, thus more number of professional institutes are proposed for future development.
- Looking in to the potential of area, Knowledge District is been proposed in region.

8.2.2 HEALTH

The existing health facilities in Dibrugarh include primary health centre, government and private hospitals, eye hospital, veterinary hospital, national polio surveillance centre and nursing homes. These facilities have been set up by both public and private sector organisations, although, the key medical facilities in the area are provided by private sector.

8.2.2.1 Current Scenario

Table 206 Existing Health Facilities of Dibrugarh Master Plan Area

Sl. No.	Health Facilities in DMPA	Number (as per Census 2011)
1	Primary Health Centre	23
2	First Referral Units	4
3	Community Health Centres	1
4	Sub-Centres	0
5	Clinic/Poly Clinic	1
6	Nursing Home	8
7	No. of Diagnostic Centres	6

(Source: Joint Director Health, Dibrugarh)



AMC Hospital

8.2.2.2 Health Facility Demand Projection

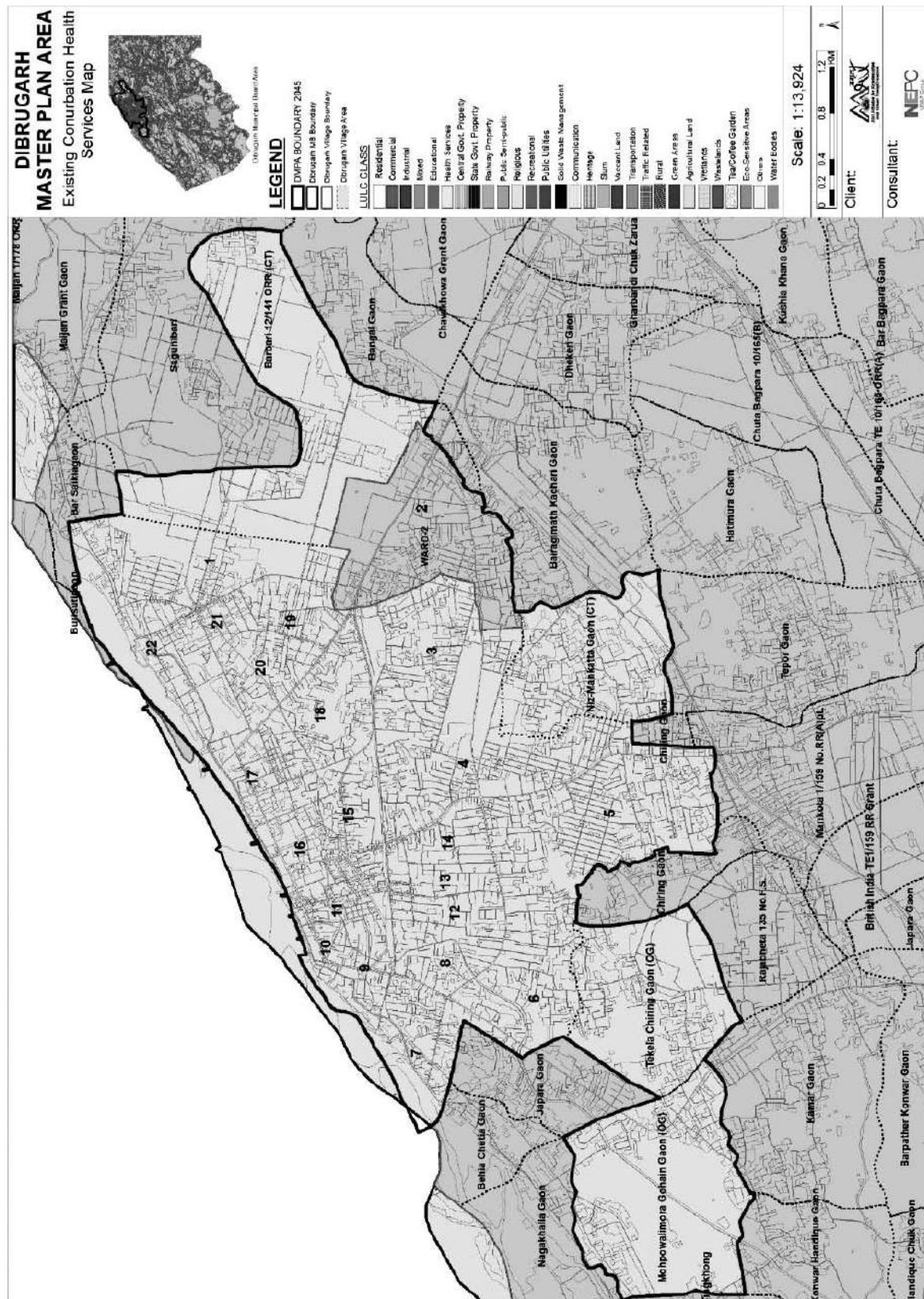


Figure 157 Spatial Distribution of Healthcare facilities in the Dibrugarh Planning Area

Table 207 Demand-Supply Gap Assessment of Medical Services

Existing Scenario					Desired Level as per URDPFI guideline	Short Term		Medium Term		Long Term		Land Requirement as per Future Need							
Sl. No.	Particular	Indicator Unit (number)	Current Level (2011)	Curr ent Gap		2021		2031		2045		Area Requir e (Ha)	Short Term		Medium Term		Long Term		
						417572		47071 9		55175 7			Gap	Total Area Requir e (Ha)	Gap	Total Area Requir e (Ha)	Gap	Total Area Requir e (Ha)	
						Dema od	Gap	Dema nd	Gap	Dema nd	Gap								
1.	Population		361397																
2.	Hospital																		
	Dispensary		23	1	15000	28	5	31	3	37	6	0.08 to 0.12 Ha	5	0.40	3	0.36	6	0.48	
	Nursing home, child welfare and maternity centre		3	5	45000 to 1 lakh	9	6	10	1	11	1	0.20 to 0.30 Ha	6	1.8	1	0.30	1	0.30	
	Polyclinic		1	4	1 lakh	4	3	5	1	6	1	0.20 to 0.30 Ha	3	0.90	1	0.20	1	0.20	
	Intermediate Hospital (Category B)	-	4	1 lakh	4	4	5	1	6	1	1.00 Ha	4	4.00	1	1.00	1	1.00		
	Intermediate Hospital (Category A)	-	4	1 lakh	4	4	5	1	6	1	3.70 Ha	4	14.8	1	3.70	1	3.70		
	Multi-Specialty Hospital	-	4	1 lakh	4	4	5	1	6	1	9.00 Ha	4	36.00	1	9.00	1	9.00		
	Specialty Hospital	-	4	1 lakh	4	4	5	1	6	1	3.70 Ha	4	14.8	1	9.00	1	3.70		
	General Hospital	-	2	2.5 lakh	2	2	2	-	2	-	6.00 Ha	2	12	-	-	-	-		
	Family Welfare Centre	-	7	50,000	8	8	9	1	10	1	500 - 800 sqm	2	1600 sqm	1	800 sqm	1	800 sqm		
	Diagnostic centre	-	7	50,000	8	8	9	1	10	1	500 sqm to 800 sqm	1	800 sqm	1	800 sqm	1	800 sqm		
	Veterinary Hospital for pets and animals	-	1	5 lakhs	1	1	1	-	1	-	2000 sqm	1	2000 sqm	-	-	-	-		
	Dispensary for pet animals and birds	-	4	1 lakh	4	4	4	-	5	1	300 sqm	4	1200 sqm	-	-	-	-		

8.2.2.3 Summary of Health Facilities Requirements

Table 208 Demand of Health Facilities & Land Requirement for 2045

Sl. No.	Particular	Demand in 2045
1.	Dispensary	37
2.	Nursing home, Child Welfare and Maternity Centre	11
3.	Polyclinic	6
4.	Intermediate Hospital (Category B)	6
5.	Intermediate Hospital (Category A)	6
6.	Multi-Specialty Hospital	6
7.	Specialty Hospital	6
8.	General Hospital	2
9.	Family Welfare Centre	10
10.	Diagnostic centre	10
11.	Veterinary Hospital for pets and animals	1
12.	Dispensary for pet animals and birds	5

(Source: Compiled by Consultant)

Based on the URDPFI Guidelines 2015, the demand of health facilities in 2045 for Dibrugarh Planning Area is worked out. There will be a need of 2 General hospital, 06 Polyclinics, 6 Intermediate Hospitals, 6 Special Hospitals and 1 Veterinary hospitals for pets and animals till 2045. This shall be spatially distributed in the planning area. Based on the area requirement for each unit, land requirement for the above-mentioned health facilities is worked out. There will be a need of 127.32 Ha. of land for the above-mentioned health facilities.

8.2.2.4 Proposed Strategies

Dibrugarh Master Planning Area is having reputed medical institutes which provided best medical facilities and medical education. The rural health system has to be improve the medical services. Government agencies carrying out the planning and implementation of the initiatives in medical services have to be provided with enough funds to upgrade the existing medical infrastructure in the government hospitals and for modernization medical equipment's. It should be made sure that the hospitals are equipped with adequate equipment's and man power to serve the population within the planning area and around it. There should be periodic monitoring and assessment of the health infrastructure within the planning area.

Some important measures that can be taken up by appropriate authority to augment and improve the Health care system and facilities in Dibrugarh Plannig area:

The rural health system has to be improve the medical services. Government agencies carrying out the planning and implementation of the initiatives in medical services have to be provided with enough funds to upgrade the existing medical infrastructure in the government hospitals and for modernization medical equipment's.

- It is also important to cater to needs and welfare of the elderly and differently-abled residents of the area. Thus, old Age Home-cum-Care Centre for Senior Citizens and Mentally Challenged should be appropriately set-up.
- Introduction of new technology like provision of multi specialty facilities and equipments etc. in the hospitals and primary health centers.
- There is requirement for training centers for nurses and paramedical staff like pathology, pharmacy may be started to train local and regional students.
- There is a need for the up-gradation of existing hospital, Clinics, Nursing Homes, etc in the planning area especially those publically owned.
- Setting up of dispensaries in rural parts of the planning area which are currently absent.

8.2.3 OTHER SOCIAL INFRASTRUCTURAL FACILITIES REQUIREMENT

Other social infrastructure facilities like commercial centres; Socio-Cultural facilities, library, milk booths, LPG Go-downs, Police stations, Judicial Court, Post Office, Fire stations, etc.; Recreational facilities like parks, Multi-Purpose Grounds, sports facilities, etc. are also essential for the balanced development of the planning area and improving the quality of life of the its residents.



7.2.3.1 Existing and Future assessment of social infrastructure facilities

Table 209 Existing and Future assessment of social infrastructure facilities

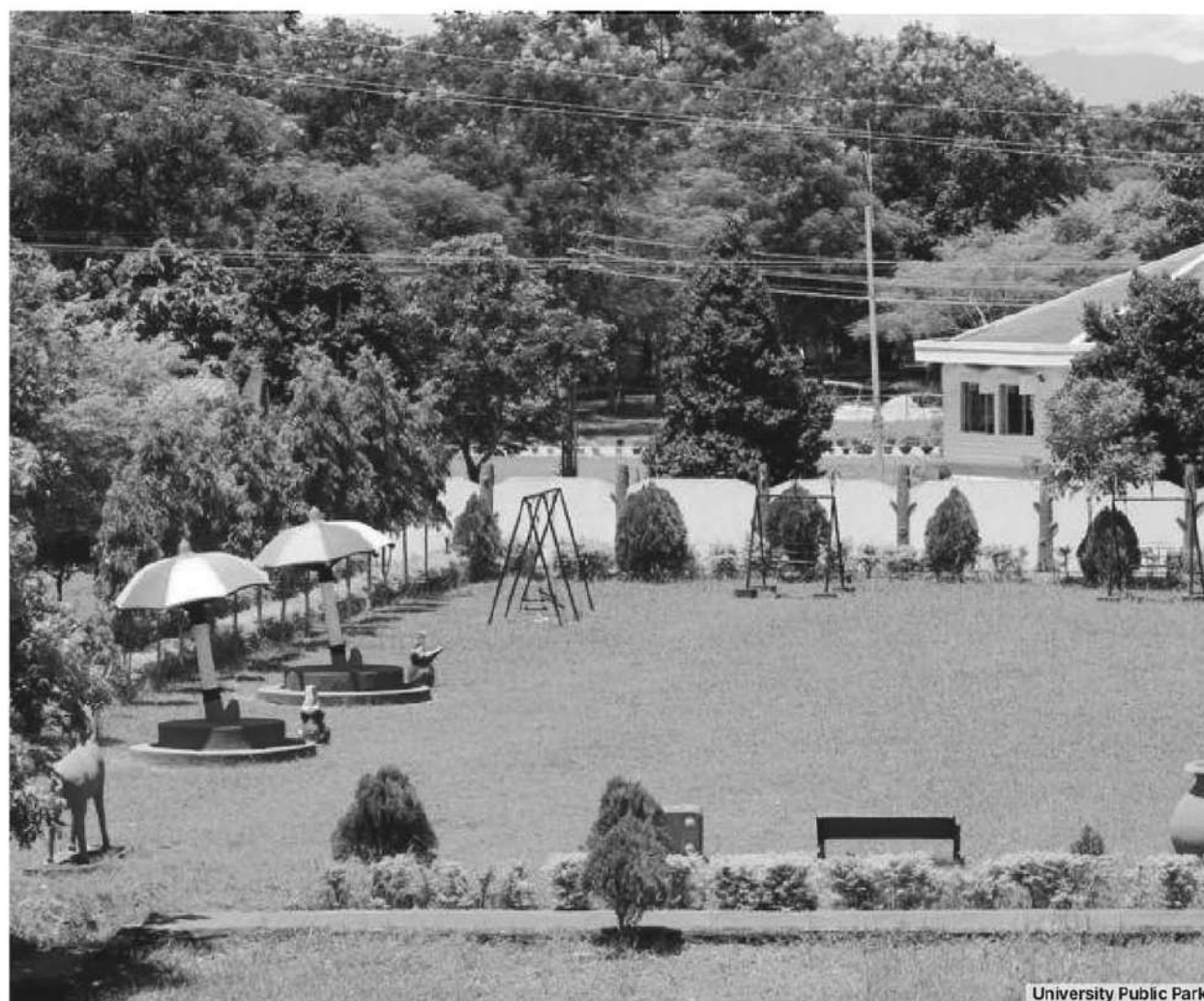
Category	Population served per unit	Area Requirement	Requirement	Existing	Future Requirement (2045)	Future Area Required
Anganwadi - Housing area/cluster	5000	200-300 sqm	110	71	39	7,800 sqm-
Community Room	5000	750 sqm	110	28	82	61,500 sqm
Community hall, mangalka, ayala, barat ghaz/library	15000	2000 sqm	37	9	28	56,000 sqm
Music, dance and drama centre	1 lakh	1000 sqm	6	-	6	6,000 sqm
Meditation and spiritual Centre	1 lakh	5000 sqm	6	-	6	11,000 sqm
Recreational Club	1 lakh	Max. 1000 sqm,	6	-	3	6,000 sqm
Old age home	5 lakhs		1	-	1	-
Religious Facilities						
At Neighbourhood /Housing cluster level	5000	400 sqm	110	28	82	32800 sqm-
At sub city level in urban extension	10 lakhs	4.00 Ha	-	-	-	-
Other Facilities						
Orphanage/ Children's Centre one each	10 lakhs	Max. 1000 sqm,	-	-	-	-
Care centre for physically /mentally challenged	10 lakhs	Max. 1000 sqm,	-	-	-	-
Working women - men hostel	10 lakhs	Max. 1000 sqm,	-	-	-	-
Adult education centre	10 lakhs	Max. 1000 sqm,	-	-	-	-
Night Shelter	10 lakhs	Max. 1000 sqm,	-	-	-	-
Socio - Cultural centre/Exhibition cum fair ground	10 lakhs	15 Ha	-	-	-	-
Science Centre	10 lakhs	As per requirement	-	-	-	-
International Convention	City level	As per requirement	-	-	-	-

8.2.4 PARKS & OPEN SPACES

Table 210 Existing and future assessment of open spaces.

Category	Population served per unit	Area Requirement (Ha)	Requirement	Existing	Future Requirement (2045)	Future Required Area
Housing Area Park	5000	0.50 to 1.00	110	71	39	19.5 to 39 ha
Neighbourhood park	10000	1.20 to 2.00	55	14	41	49.20 to 82
City Parks/ playgrounds/ maidan/exhibition grounds/ cultural gathering grounds	1 for every town	—	—	—	—	—
Botanical Garden	1 for every town	10.00 to 20.00	—	—	—	—
Recreational complex including zoo	1 for every settlement with tourist potential	10.00 to 12.00	—	—	—	—

(Source: Compiled by Consultant)



University Public Park

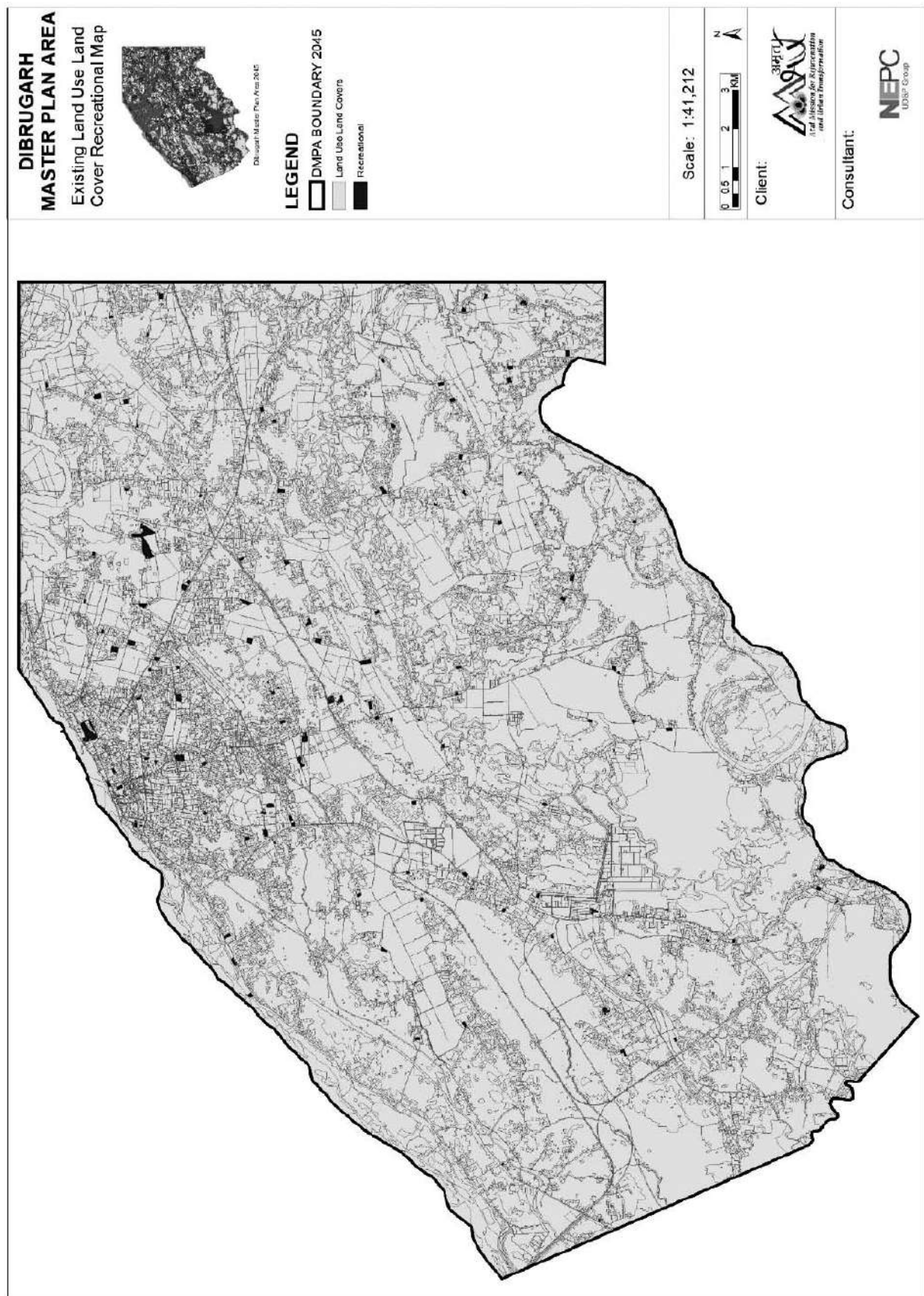


Figure 159 Recreational Facility spatial distribution Map

8.2.5 MULTI-PURPOSE GROUNDS AND SPORTS FACILITIES REQUIRED*Table 2f1 Existing and future assessment of multipurpose grounds and sports facilities*

Category	Population served per unit	Area Requirement (Ha)	Requirement	Existing	Future Requirement (2045)	Future Required Area
Sub city level multipurpose ground	10 lakhs	8	-	-	-	-
District level multipurpose ground	5 lakhs	4	1	-	1	4ha
Community level Multipurpose ground	1 lakh	2	5	-	5	10ha
Residential unit play area	5,000	5000 sqm	137	28	109	545,000sqm
Neighbourhood Play area	15,000	1.50 ha	46	9	35	52.5ha
District Sports Centre	1 lakh	8.00 ha	7	-	7	56ha
Divisional Sports Centre	10 lakhs	20.00 ha	0	-	-	-

(Source: Compiled by Consultant)

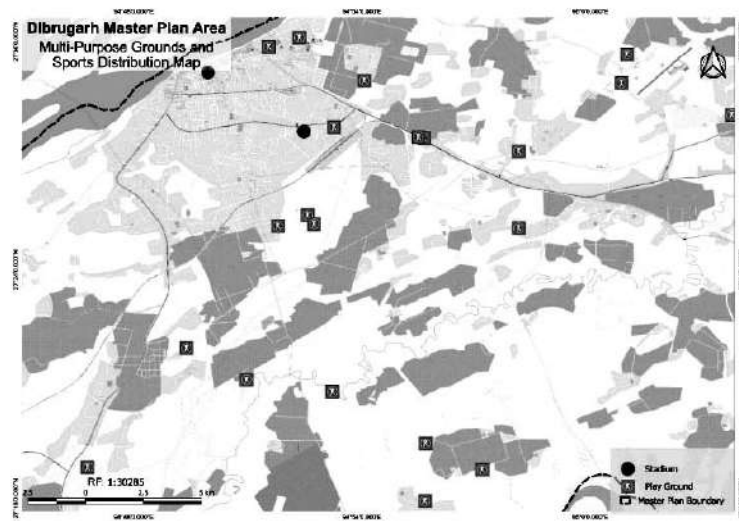


Figure 160 Multi-Purpose Grounds and Sports spatial distribution Map



Jalan Nagar Stadium

8.2.6 COMMUNITY FACILITIES

8.2.6.1 Existing Communities and other Facilities

Table 212 Existing Communities Facilities

Sr. No.	Facilities	Numbers
1	Corporation Gardens	1
2	Community Hall	15
3	Swimming Pool	2
4	Corporation Playgrounds	6
5	Gymnasia	10
6	Corporation Stadium	4
7	Cinemas	2
8	Open Air Theatres	0
9	Zoo	0
10	Public libraries	1
11	Art Galleries	0
12	Museum	3
13	Other (specify)	-
14	Fire Services	1
	No. of Fire stations	1
	No. of fire tenders	5
	Personnel	32
15	Cremation/Burial Ground	5
16	Petrol/Gas Station	11
17	Hotels and Eating Places	350

(Source: Dibrugarh Municipal Board)

Table 213 Existing Toilets

Sr. No	Facilities	Numbers
1	Public toilets (in no.)	15
2	No of Toilets Pay & Use	4
3	Users per toilet daily (in No)	570
4	Average User Charge	Rs 5
5	Average yearly expenditure on maintenance (Rs. In Lakh)	1,00,000

(Source: Dibrugarh Municipal Board)



8.2.6.2 Existing and Future assessment of Community facilities

Table 214 Existing and Future assessment of community facilities.

Category	Population served per unit	Area Requirement (Ha)	Requirement	Existing	Future Requirement (2045)	Future Required Area
Milk Booths	5000	0.015	137	28	109	1.64ha
LPG Godowns	50000	0.2	14	-	14	2.8ha
Police Station	90000	1.5	8	1	7	10.5ha
Police Post	40000	0.16	18	6	12	1.92ha
District Jail	1000000	10	0	1	-	-
Fire Station	200000	1	4	1	3	3ha
Sub Fire Station	within 3-4km radius	0.6	-	-	-	-
Disaster Management Centre	One in each administrative zone	1	-	-	-	-
Post Office	15000	0.6	46	9	37	22.2ha
Graveyard / Burial Ground	10000	1	68	14	54	54ha

(Source: Compiled by Consultant)

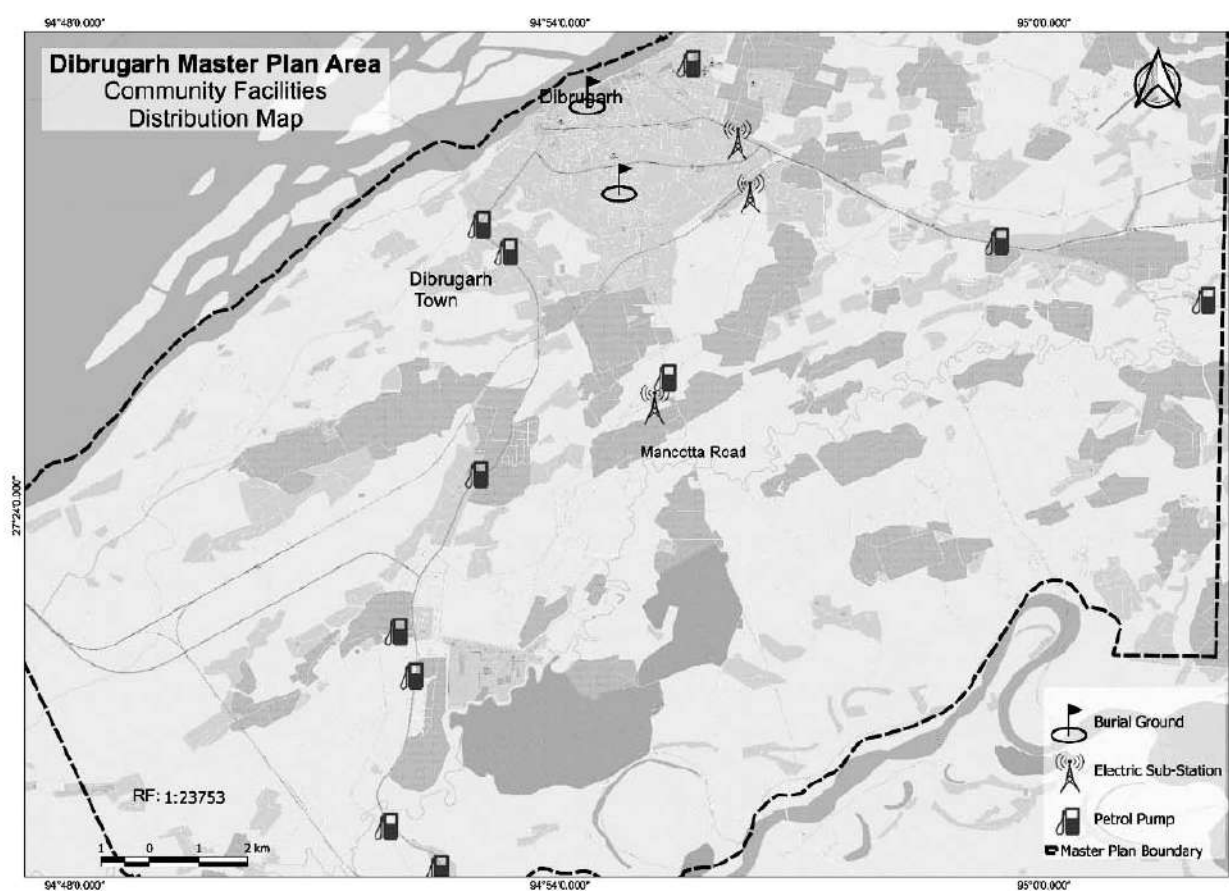


Figure 161 Community Facilities spatial distribution Map

8.2.7 COMMERCIAL FACILITIES

8.2.7.1 Existing Commercial Facilities

Table 215 Existing Commercial Facilities

Year	Hotel	Restaurant	Wholesale	Retail shop
2011	-	-	-	-
2012	-	-	-	-
(up to 2019)	250	70	75	3500

(Source: Dibrugarh Municipality)

8.2.7.2 Existing and Future assessment of Community facilities

Table 216 Existing and future assessment of commercial facilities

Category	Population served per unit	Area Requirement (Ha)	Requirement	Existing	Future Requirement (2045)	Future Required Area
Convenience Shopping	5000	0.15	137	28	109	16.35ha
Local shopping including service centre	15000	0.46	46	9	37	17.36ha
Community centre with service centre	100000	5	7	-	7	35ha
District centre	500000	1	1	-	1	1ha

(Source: Compiled by Consultant)

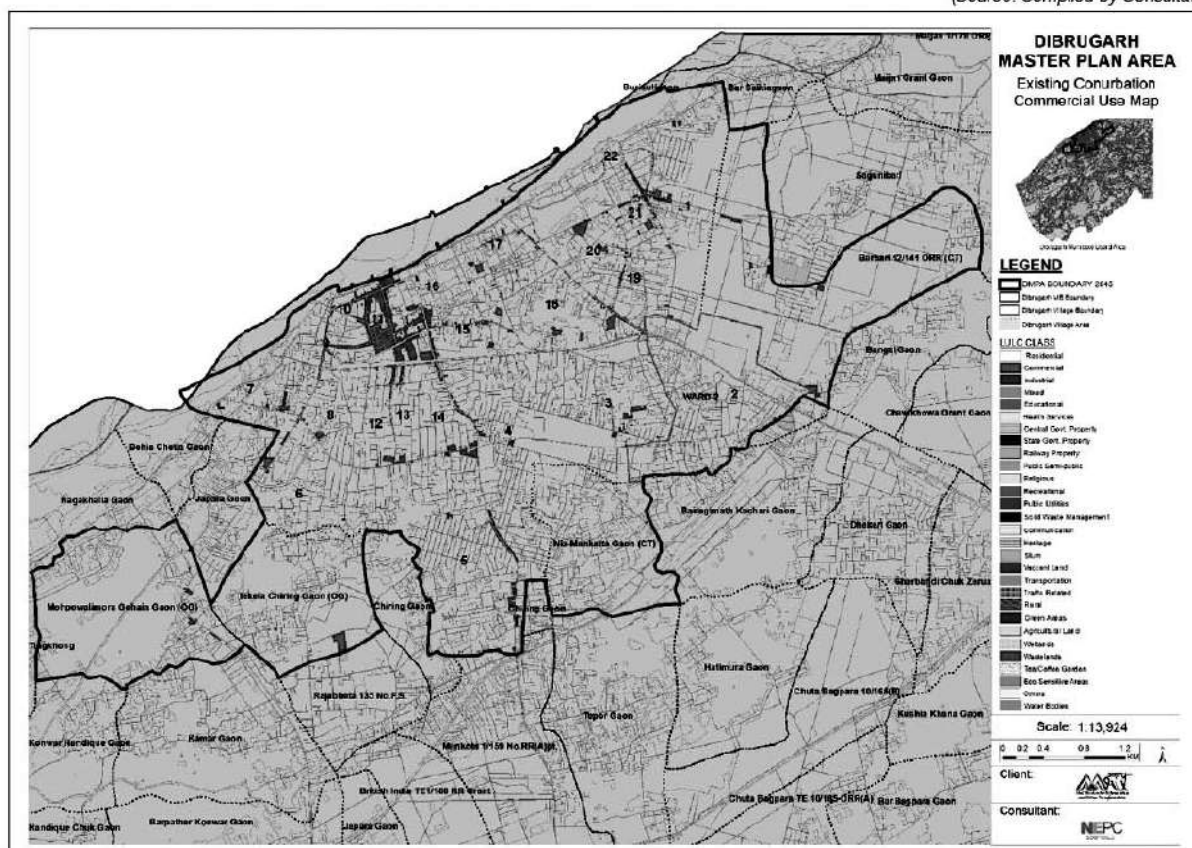


Figure 162 Commercial Facilities spatial distribution Map

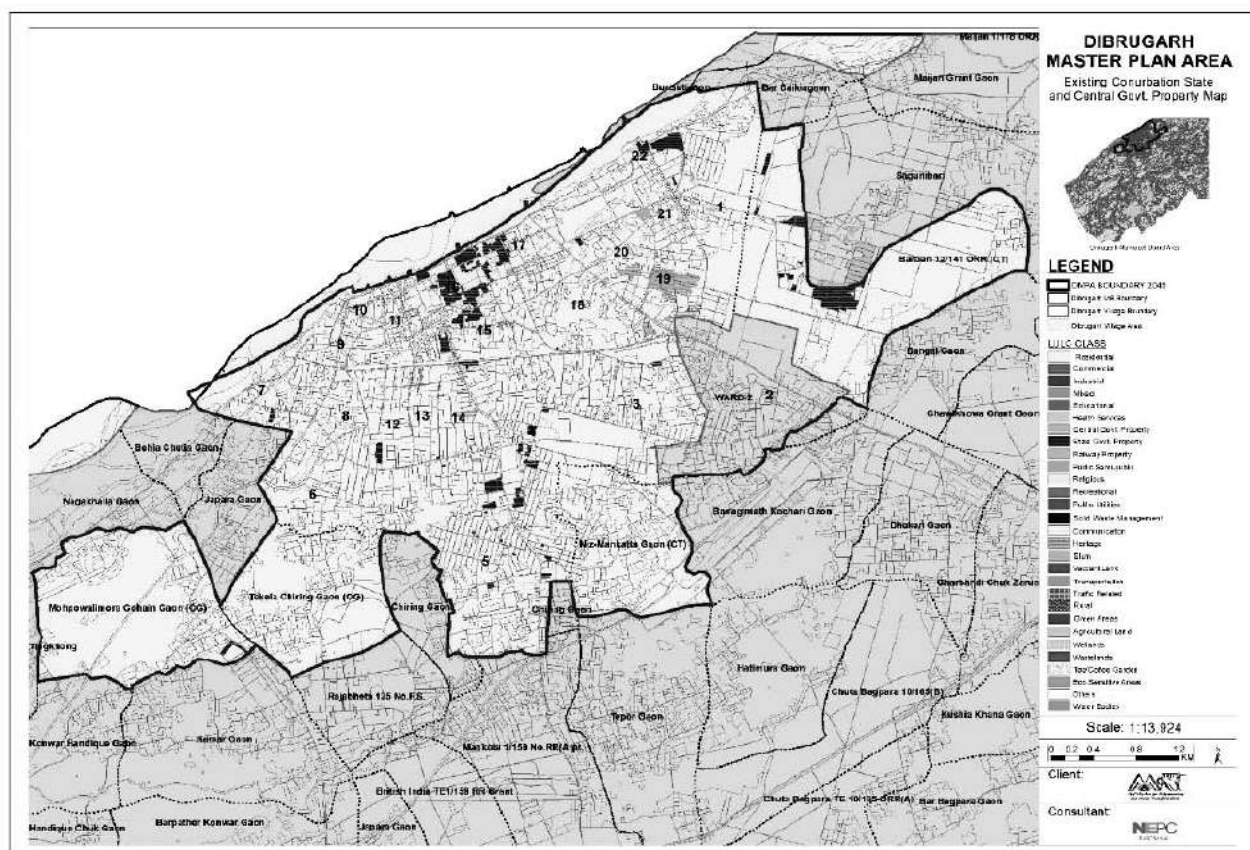


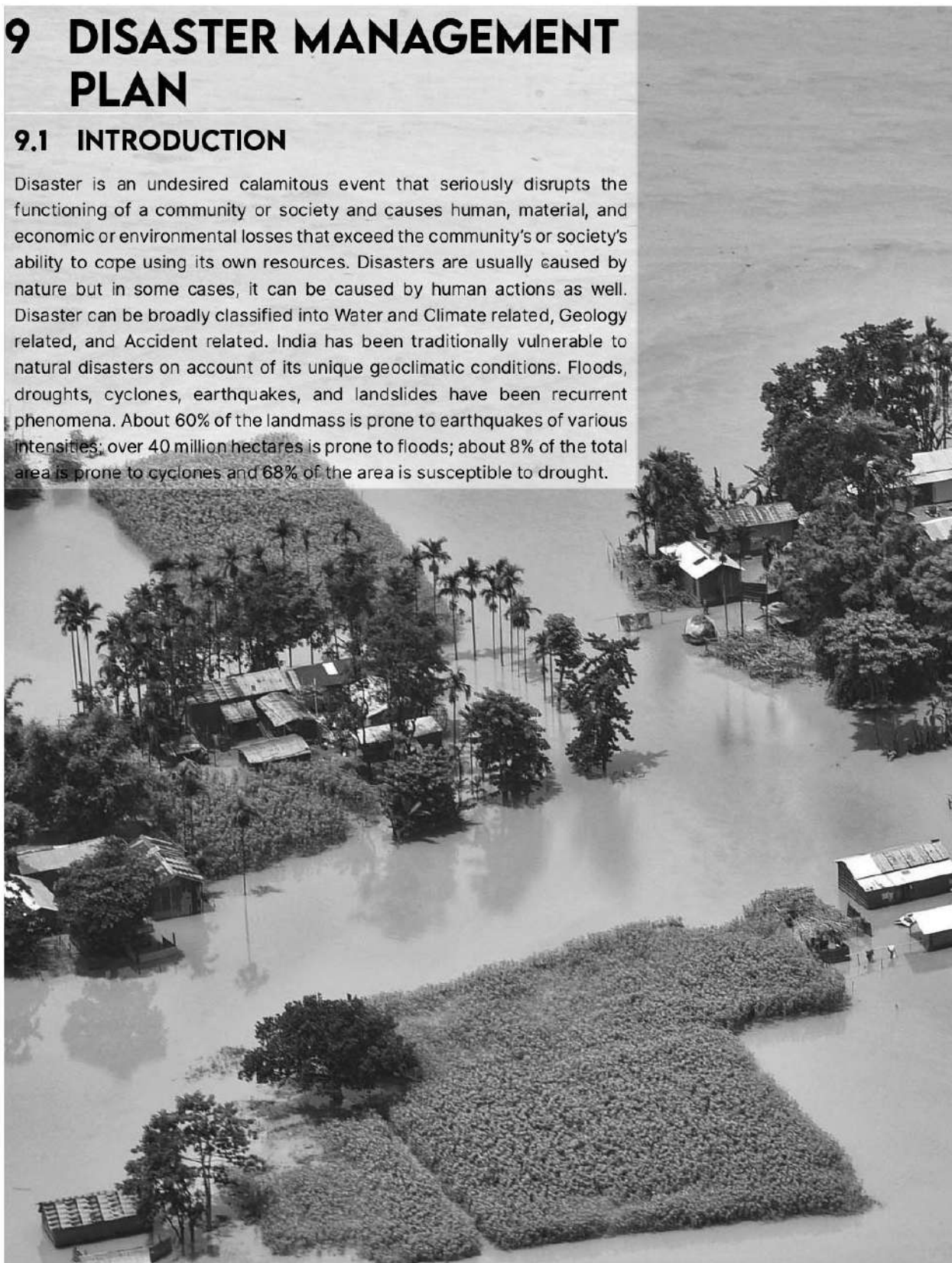
Figure 163 Govt. Asset spatial distribution Map



9 DISASTER MANAGEMENT PLAN

9.1 INTRODUCTION

Disaster is an undesired calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Disasters are usually caused by nature but in some cases, it can be caused by human actions as well. Disaster can be broadly classified into Water and Climate related, Geology related, and Accident related. India has been traditionally vulnerable to natural disasters on account of its unique geoclimatic conditions. Floods, droughts, cyclones, earthquakes, and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought.





At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis. The Ministries/Departments/Organizations concerned with the primary and secondary functions relating to the management of disasters include India Meteorological Department, Central Water Commission, Ministry of Home Affairs, Ministry of Defense, Ministry of Finance, Ministry of Rural Development, Ministry of Urban Development, Department of Communications, Ministry of Health, Ministry of Water Resources, Ministry of Petroleum, Department of Agriculture & Cooperation, Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, Planning Commission, Cabinet Secretariat, Department of Surface Transport, Ministry of Social Justice, Department of Women and Child Development, Ministry of Environment and Forest, Department of Food.

Location: The region falls in the North eastern part of India and in the extreme east of Assam between 26.50-27.900 north latitude and 93.46-96.100 east latitude. The soil is mostly of alluvial origin. Due the heavy rainfall with cool and pleasant climate, vegetation growth is rich. The annual mean of maximum temperature is 27.30 Celsius, while the mean of minimum is 18.40 Celsius. On the other hand, the minimum relative humidity is 64 whereas maximum is 90.

With the passing of years Dibrugarh has become a fully-grown urban centre of upper part of Assam and become the hub of administrative, educational, and commercial activities. The district is located about 103.74 M above the mean sea level. It has the boundaries as follows

North : Dhemaji District and part of Lakhimpur District

South : Sivasagar District

East : Tinsukia District

West : Sivasagar District

The area stretches from the North Bank of the mighty Brahmaputra, which flows a length of 95km through the northern margin of the district, to the Patkai foothills on the South. The Burhi Dihing, a major tributary of the Brahmaputra with its network of tributaries and wetlands flows through the district from east to west. Till the great earthquake of 1950, the north easternmost corner was drained by the Dibru River. The Dibru was a main tributary of the Brahmaputra the confluence of it being at about 18km east of Dibrugarh City. By raising the bed of the Brahmaputra, the earthquake caused severe erosion on its south bank and as a result the Dibru river got merged with its master stream in Rahmaria mouza.

The district suffers following major natural hazards – floods, chemical disasters (fire), draught, famine and earthquake, which are of high frequency of occurrence. In the past years, flood has become a sorrow for the people of Dibrugarh District. Immediately after the great Independence Day earthquake of 1950, consequent land slides in the catchment's areas of Brahmaputra and other tributaries have changed the topography of the rivers. The impact was so morable that river Brahmaputra changed its course with a raised bed. A number of public and private buildings along with major portion of Dibrugarh town were rapidly devoured by Brahmaputra within a short span of couple of years. Dibrugarh Town is 103.74 metres above the sea level whereas an average land of river Brahmaputra remains at 104.35 to 104.65 metres above the mean sea level. The highest flood level recorded was 106.48 metres. Ironically, during the flood season, the people of Dibrugarh are living about three feet of river water level.

9.2 CURRENT SCENARIO

The Dibrugarh Town Protection (DTP) Drain which runs through the heart of the Town falls at Rajabheta stream at a distance of 5 km. from the town. During the rainy seasons and heavy showers, the drain overflows. A second drain carries water from East-West and central Chowkidinghee and Santipara area to the DTP drain. The third drain i.e., the Rajabheta drain is also not capable of carrying the water load during heavy showers. On the other hand, most of the roadside drains are kutchha and have mild gradient towards the outfall. The low discharging capacity of these drains, poor drainage system and unfair construction practices has been the main determinant of artificial flood and water logging problem in the town. **The worst affected areas are Dibrujan, Grahambazar, Part of Gabharupathar, Khalihamari, Lachit Nagar, (Ward no.4)**

Because of the arrival of the southwest Monsoon and with the continuous heavy rain, the water level of the Brahmaputra rises rapidly. During this period, the main drain could not find a gradient to discharge the water from the town area and waterlogged in various pockets cause artificial flood. Pumping out this logged water gives only a temporary solution to the problem. In addition, there were certain areas like ward no.2 which was used as natural reservoir in earlier days do not exist at present. This also contributes to the problem of artificial flooding. On the other hand, individual service pit and Sanitary Latrine serves the sewerage system.

The basic objective of current Disaster Management Action Plan is to protect all the residents and the wealth of the region from all sort of untoward incidents through the following objectives:

- To prevent loss of human lives and property.
- Institutionalization of disaster management in district administration level.
- Encourage a culture of disaster preparedness.
- Vulnerability reduction and disaster mitigation through better planning process.
- Creation of best government mechanism to handle and unprecedented events.
- Instant response and effective decision making in disasters.
- Better coordination of relief and rehabilitation in the aftermath of a disaster.
- Better coordination of all line departments in disaster management.
- Regular updates of resources in and around the district.



9.2.1 FLOOD

The tributaries of the Brahmaputra have widely divergent characteristics in the district. 45 per cent of Assam's total area is flood prone. The Brahmaputra River with its 34 tributaries causes regular floods in the state. The average annual rainfall in the state is 1662.2 mm. Ninety per cent of the heavy downpour occurs in the months of April-September. In 1999, more than 200 villages were inundated, and 0.27 million people in 749 villages of 10 districts were affected. In the year (2001), 94,382 people in 12 districts and 483 villages were severely affected. Road and rail communication was cut off in many districts. In 2000 alone, 3 million people lost their homes and vast stretches of paddy were swallowed by floodwaters. During 2002 floods 41 people have lost their lives, 19,827 houses damaged, and 0.3 million hectares of cropped land has been affected. During 2003, 30 people have lost their lives, 4660 houses have been damaged, and 0.2 million hectares cropped area has been affected.

On the Brahmaputra the fluctuations in river levels begin towards the end of March or early part of April, when the Himalayan snow begins to melt. From this period onwards the Brahmaputra River levels records a series of "pumps" or rises for short duration till the end of April, when a more defined rise is felt and in early May, the first flood rises are experienced. As a rule, the first big rise is of short duration and does little harm to the land or early cultivation. By early June the southwest Monsoon registers its arrival in the Assam Valley and with the continuous heavy rain, river levels rise rapidly, and the Brahmaputra remains in flood condition, registering a series of peak flood levels till October. The Brahmaputra has been the main determinant of flood in the district of Dibrugarh. Due to increase of the water level of this mighty river Brahmaputra and also of the river Buridihing inundation of the catchment areas of the river causes flood. This is the main reason of flood in the villages of the Chabua/Dibrugarh East/West Revenue Circles, Tengakhat, Moran Revenue Circle of the District. It causes a back flow of the water of its tributaries causing flood. This type of back flow causes flood in places like Madhupur forest village area, Kolakhowa area, Garudhoria area under Dibrugarh West Revenue Circle. In the district of Dibrugarh, the entire length of the river Brahmaputra is not protected by Water Resources dike which was constructed in three phases in the fifties protecting the district right from the Oakland Tea Estate upstream to Dehingmukh gaon in the downstream. A stretch of about ten kilometers on either side of the dike is open to the onslaught of the river and is responsible for the main inlet for the floodwater.

Table 217 Flood occurrence from 2011 -2020

Sl. No.	Year of Occurrence	Area Affected	Population affected
1	2011	NIL	NIL
2	2012	104	96682
3	2013	NIL	NIL
4	2014	102	68697
5	2015	257 (22 MNC ward)	145035
6	2016	148	78372
7	2017	111	70072
8	2018	15	9491
9	2019	125	65761
10	2020	251(22 MNC ward)	86776

(Source: Department of Disaster Management, Dibrugarh)

Table 218 Flood disastrous details

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected	Name of localities	Population affected
1	Flood	2012,2014,2015,2016,2017,2018,2019 &2020	Dibrugarh 22 Municipal wards & 257 Villages	Tengakat, Nahrkta, part of rihabari ward towards the western side of Mancota road. Parts of ward no.10,11 & 16), Dibrujan, Grahambazar, Part of Gabharupathar, Khalihamari, Lachit Nagar, (Ward no.4), Jibon Phukan Nagar, East, South & North Milan Nagar, Rup Nagar, Santipara (Ward no. 13 &14)	1.45 Lakh (2015)

(Source: Department of Disaster Management, Dibrugarh)

Elements at Risk: The key factor that contributes to vulnerability of human populations/ infrastructures to disasters are:

- Peoples residing along the bank of Dibrugarh Town Protection Dyke from Mohanaghat to Maijan and their property
- Peoples residing in the flood affected villages of Dibrugarh East, Dibrugarh West and Chabua Revenue Circle
- The slum pockets in the Town which is about 17.67% of the total population of the Municipal area. During rainy season most of the slum areas becomes waterlogged due to which the existing kutchha roads as well as graveled roads has become badly damaged.
- Babies of age group 0-6 years (11,862 as per 2001 census)
- 70, 692 number of female (2011 Census)

9.2.2 EARTHQUAKE

Around 58 % of the territory of India is vulnerable to earthquake, and the country has experienced 3 main earthquakes in the past few decades. The state of Gujarat has experienced a major earthquake in January 2001, Jammu & Kashmir in October 2005 and Sikkim in 2011. The major consequences of any earthquake are widespread human and material losses, excessive damage to infrastructure and services. According to the Geographical Survey of India, Seismic Zoning Map of the country, Silchar region lies in Zone-V which is said to be the most active semis zone in the Country. The North-East part of the country were the Dibrugarh region lies has observed major earthquakes in year 1984 and 2009.

Table 219 Earthquake in Dibrugarh

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected	Name of localities
1	Earthquake	1950	Destroyed almost 70 villages, Later the hills and rocks around the geography and Landslide block the dibru river.	Dibrugarh was partly destroyed

(Source: Largest earthquakes in the world since 1900, Sep 20, 2011)

9.2.3 RIVER EROSION

River erosion is a season specific calamity observed in certain period of time mostly in fixed seasonal interval. In rainy season specifically from months April to July, when Brahmaputra river flows in its peak capacity level, the erosion on banks becomes disaster for the bank settled informal settlements. In year 2008 And 2010 river erosion in a massive scale was observed.

Table 220 River erosion

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected
1	River Erosion	2010, 2008	Rohmorla and Dibrugarh town

(Source: Water resources assam govt.)

9.2.4 STORM

At least 45 people have died and around 4,000 were injured in the worst cyclonic storm to hit India's north-eastern state of Assam in 2005. The storm was so severe, number of people were blown away and some are still missing. The storm, which was accompanied by heavy rains, raged for 30 minutes through remote villages in Assam's Dhubri district and in parts Dibrugarh district.

Table 221 Storm

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected
1	Cyclone storm	2010, 2016, 2019, and 2020	Area around Dibru river

Table 222 Natural disaster in Dibrugarh district

Sl.No	Year	Fire	Flood	Storm	Lightning	Electrocution	Boat mishap	Bridge collapsed
1	2010	0	0	2	0	0	6	0
2	2011	0	0	0	0	0	0	0
3	2012	6	0	0	0	0	0	0
4	2013	0	0	0	0	0	0	0
5	2014	0	0	0	0	0	0	0
6	2015	7	0	0	0	0	0	0
7	2016	4	0	1	2	0	2	1
8	2017	2	0	0	2	0	0	0
9	2018	0	5	0	1	0	0	0
10	2019	0	0	4	0	4	0	0
11	2020	7	5	1	0	4	0	0
Grand Total		26	10	8	5	4	8	1



9.3 SEASONAL HAZARD ANALYSIS

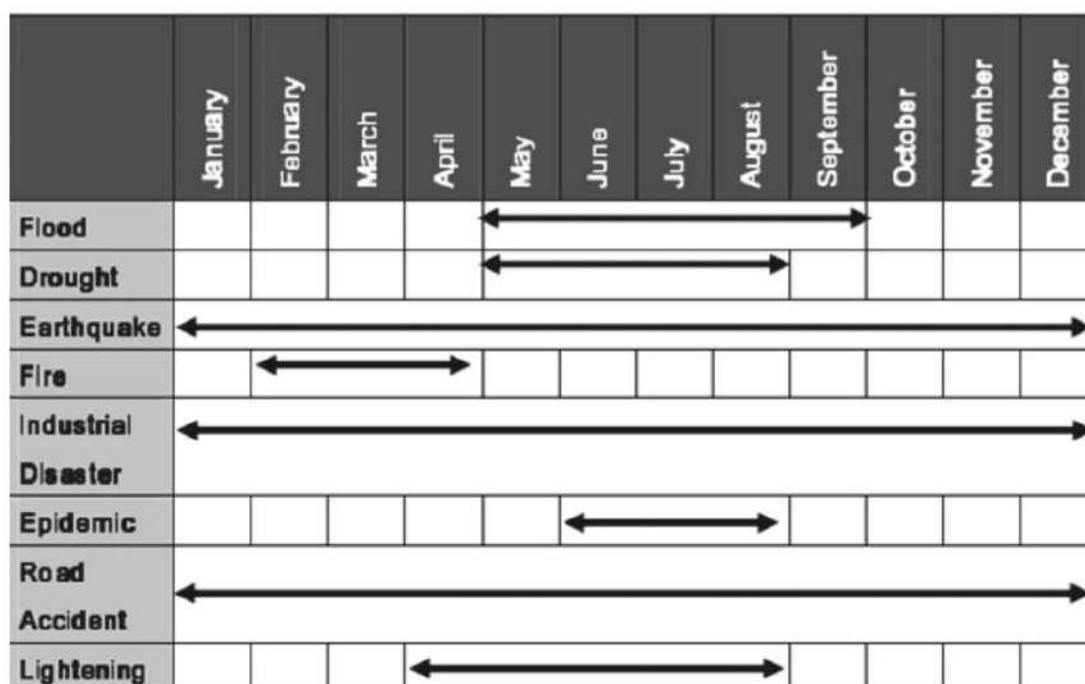


Figure 164 Seasonal Hazard Analysis

(Source: Department of Disaster Management, Dibrugarh)

9.4 DISASTER VULNERABLE AREA MITIGATION PLAN

Any disaster management plan or emergency management plan consists of four phases, namely: Mitigation, Preparedness, Response and Recovery. The mitigation component in an emergency management plan is aimed at reducing the risk, impact, effects of a disaster. Hence careful planning in the mitigation phase is important to reduce or eliminate the Longterm risk to human life, property from natural and manmade calamities. It's important to have mitigation plans led by local community, working together to identify, plan for in the event of a disaster and reduce vulnerabilities and promote long term personal and community resilience and sustainability. Mitigation plans can concentrate on both pre-disaster and post disaster efforts to reduce the impact of the disaster.

Pre-disaster Mitigation should focus on projects and interventions to address natural and man-made disaster to reduce risk to the population and property. This is mainly achieved by strengthening the resilience of National/State Infrastructures. Post-disaster Mitigation efforts are primarily designed to reduce future damage in an affected area and decrease the loss of life and property due to the incidents following the disaster. The essential steps of hazard mitigation are: -

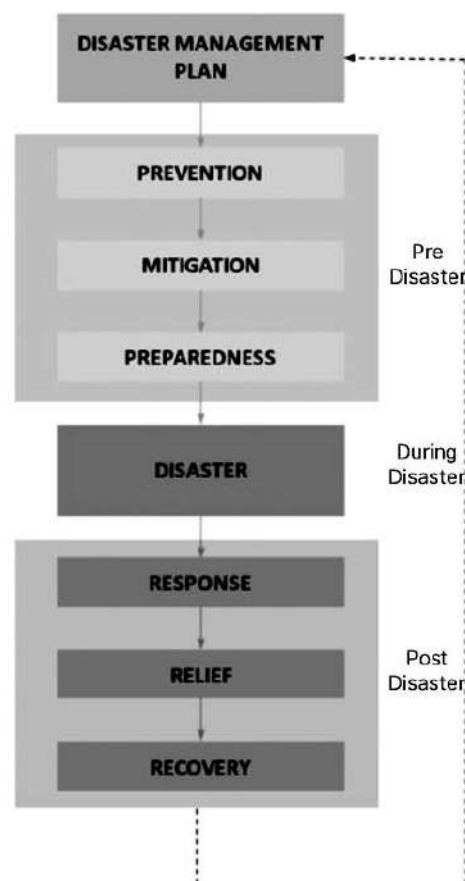


Figure 165 Disaster management plan

- Hazard Identification.
- Vulnerability Analysis.
- Defining a Hazard Mitigation Strategy.
- Implementation of Hazard Mitigation Activities and projects.

The Dibrugarh region is more prone to Floods, than any other natural disasters hence the disaster vulnerable area mitigation plan focuses on flood and cyclone related eventualities and how can it be mitigated and have a better preparedness. It is important to note that disaster management is an integrated task involving various government departments of region and the plan should focus on prevention, preparedness, mitigation, response, and relief measures.

9.4.1 PREVENTION PLAN

9.4.1.1 Measures already taken

The Dibrugarh Town is protected by Water Resources dyke which was constructed in three phases in the fifties, protecting the district right from the Oakland Tea Estate upstream to Dehingmukh gaon in the downstream.

These construction activities though initially help in protecting Dibrugarh town, continuous erosion at Maijan, Mathala, Oakland, Barsaikia Gaon with a major portion of Rangagarah Tinsukia Road connected with Maijan T.E. and adjoining areas located east of Dibrugarh town, creates threats to these measures. It was estimated that an area of 2,581.22 acres of tea-bearing and other rich land has been eroded. Several measures that have been taken by the Water.

Resources department for the safety of dykes as well as to reduce the overflow of rainwater through canals be follows:

- Stone Bouldering and RCC purcopine screening along the dyke in Mohanaghat during 2010-11 (work completed)
- Clearing of water plants from dike and the protection of drains is made during the rainy season
- The existing sluice gates are operated regularly to discharge the stagnant water
- Strengthening and Widening of Dibrugarh Town Protection Dike and to its upstream under Flood and Riverbank Erosion Dibrugarh Sub-Project of FREMAA funded by Asian Development Bank (Work complete)
- Strengthening of DTP stone spurs under Flood Management Programme (Central Government Scheme – Work completed)
- Screening by Geo-bags and Purcopine in Rohmoria area under Flood Management Programme has been completed.

9.4.1.2 Measures need to be taken

As part of prevention of the said natural disasters, the following measures can be adopted by concerned government departments to avoid and minimize the impacts of natural disasters.

- The Water Resource Department should monitor the major water bodies like rivers,
- Streams, lakes for constant flow of water, rising levels, and identify potential areas along the water bodies which need additional embankment or revetments, and these works should be implemented on priority before the onset of the season.
- Power and Communication should carry out through inspection of power lines, communication lines for

defects and rectify them. Trees and branches which may damage power and communication lines should be trimmed or removed.

- Health department should ensure that the primary practice upon triage and community health centers are equipped with medicines and medical staff. Preventive vaccines for epidemics should be stocked in adequate quantity. Chlorination of drinking water should be ensured to avoid the outbreak of epidemics in the event of cyclones and floods.
- The Department of District Disaster Management Authority is the nodal agency in the Dibrugarh Region and has already handled several flood and cyclone situation in the region. From this experience, it should be able to identify the low lying and vulnerable areas and the population of such places must be warned to be alert and to be ready to move to the cyclone shelters or to safer areas or to the relief camps in case of warning of disaster.
- The Department of Civil Supplies & Consumer Affairs should decide for creation of buffer stock of food grains by making required withdrawal from the Food Corporation of India. Also, adequate quantities of Kerosene and diesel should be procured and made available through the Fair Price Shops.
- Department of Agriculture should take steps to publicise precautionary measures to be taken to save the standing crops in the vulnerable areas. Farmers should be encouraged to have platforms in their fields to stock the crops. Desilting of public and private irrigation channels should be ensured for quick drainage of paddy fields.
- Fisheries & Fishermen Welfare Department shall alert all the riverside villages and hamlets about the impending natural calamity and advise the fishermen not to venture into sea till normalcy is restored.
- Department of School Education shall keep all schools ready for accommodating the evacuees and keep the Central Kitchens to function around the clock with in charge of the centres. NCC and NSS students shall also be grouped to send them for relief works and evacuation mockdrill practice in school.
- Transport Department should keep ready the list of sufficient numbers of earthmoving vehicles, transportation vehicles such as trucks, tractors, tippers, mini buses etc. Further, all the listed vehicles allocated in connection with calamity has to be kept in roadworthy condition for using them in emergency.
- Fire Services Department and State Disaster Response Force shall keep available sufficient number of rescue materials, like life jackets, buoys, ladders and ropes.
- Similarly, the Fire Services Department shall set up Search & Rescue Team consisting of at least 6 members of each Fire Service Station.
- Department of Animal Husbandry & Animal Welfare should store fodder, cattle feed, poultry food etc. and also carry out the inoculation of animals against epidemics. The Key Village Units should harbour stray cattle with shelters.
- Local Bodies shall make arrangements for availability of Generators and pump sets at short notice. For areas with waterlogging Local bodies should clear the L & U type drains which normally clog due to plastic materials and silt.
- The Police Department shall set up a Search & Rescue Team which shall contain at least 20 Police Personnel for each jurisdiction of the Superintendent of Police.

Identification of hazardous locations in different Circles is to be done and marked on the map. Basically, these locations are found prone to fire, earthquake, and artificial flooding. Fires found to be spread out mostly as a result of narrow roads while artificial flooding because of poor drainage pattern. North East

Space Application Centre has been entrusted to Hazard, Risk & Vulnerability mapping of Dibrugarh Town by Assam State Disaster Management Authority. Master Plan of Drainage pattern is to be completed by Town & Country Planning. Disaster Management Plan should be prepared by all concerned departments as per Disaster Management ACT 2005.

There are 2 types of majors Structural and non-structural i.e., Steps are to be taken to mitigate the problems out of Erosion, threat to DTP dyke, banks of Brahmaputra & Buridehing, Fire & Earthquake and Training of Village Land Management and Conservation Committee Members (VLMCC) on preparation of Village Master Plan and Constitution of Ward Disaster Management Committee in 22 wards of Dibrugarh Municipal Board and follow up action

The activities of different line departments to save the life of people and properties in accordance with disaster management cycle. Police departments, Police control room, Wireless facilities, Fire and emergency services and civil defense and home guard.

Table 223 Measures to be Taken for Prevention Plan

Sl. No.	Structural measures	Non-structural measures
1	Installation of Water Collection Deep Tube Well Pumps at five selected sites to be used for firefighting purposes	Training of Village Land Management and Conservation Committee Members (VLMCC) on preparation of Village Master Plan
2	Water Pumps to install in identified locations to pump out logged water	Constitution of Ward Disaster Management Committee in 22 wards of Dibrugarh Municipal Board and follow up action
3	Construction of Wodden Boat to be used for rescue purposes	Public awareness programmes on Safe Construction Practices & Earthquake Preparedness in different wards of Dibrugarh Town, Moran & Naharkatia
4	Redesign existing storm water and drainage systems in flood prone areas	Training of Doctors on Emergency Health & Mass Casulty Management
5	Erosion protection works in vulnerable reaches along the bank of river Brahmaputra and Buridehing including breach closing works	Training of Engineers on Rapid Visual Screening
6	Undertake structural safety audit of lifeline buildings and schools	Workshop on Earthquake Risk Mitigation and Management
7	Undertake structural safety audit of Shopping Malls, Nursing Homes, multistecored buildings	Training of Task Force Members (Quick Response Team) on Search, Rescue and First Aid
8	Map locations of all key buildings in the District and rate them on the basis of rapid visual screening exercise/ Non-Destructive (ND) Test	Earthquake Shakeout programme in schools
9	Undertake retrofitting of key lifeline and critical/ social infrastructure	Training of Principal/ Head Masters of HS/High/ME/LP schools on School Safety & Disaster Management
10	Adopt zoning parameters as identified in the Model Building Byelaws issued by MHA (Sept. 2004)	Mock exercises in several locations
11	Fire Safety Audit of Shopping Malls, multi-steoried buildings as per underlying norms National Building Code	Training programmes on Disaster Management conducted for the officers & staff of different vital Govt. establishments
12	Enforcement of National Building Code/Indian Standard Code of Practice (BIS) and Assam Notified Urban Areas (Other than Guwahati) Building Rules, 2014	Disseminate alert and warning mechanisms of flood early warning system (FLEWS) project to communities (preferably through VLMCC)
13	Works to widen and strengthen the Dibrugarh Town Protection dyke	Increase public awareness of flood hazard and mitigation possibilities
14	Conduct detail flood hazard mapping of the District	Promte flood insurance
15	Map all infrastructure at risk to varying intensity of flood hazard	Disseminate flood hazard mapping information to stakeholder
16	Identify areas prone to sediment built up and measures to take up	Undertake Undertake Mock Drill on flood rescue

9.4.2 MITIGATION AND PREPAREDNESS PLAN

Pre- disaster planning consists of activities such as disaster mitigation and disaster preparedness. Disaster mitigation focuses on the hazard that causes the disaster and tries to eliminate or drastically reduce its direct effects. The best example of mitigation is the construction of embankments and construction of proper drainage system in flood prone areas to avoid floods. The other example includes retrofitting of weak buildings to make them earthquake resistant.

And preparedness focuses on plans to respond to a disaster threat or occurrence. It takes into account an estimation of emergency needs and identifies the resources to meet the needs. The first objective of the preparedness is to reduce the disaster impact through appropriate actions and improve the capacity of those who are likely to be affected most. The second is to ensure that ongoing development continues to improve the capacities and capabilities of the system to strengthen preparedness efforts at community level. Finally, it guides reconstruction so as to ensure reduction in vulnerability. The best example of preparedness activities are the development of community awareness and sensitization system through community education and administrative preparedness by way of stockpiling of supplies, developing emergency plans for rescue and relief.

For a successful mitigation plan it is necessary to identify short-, medium- and long-term mitigation measures for various hazards for structural and non-structural risks and damages. Mitigation measures should focus to reduce both the effect of the disaster and the vulnerable conditions to it, in order to reduce the scale of a future disaster and its impacts. Mitigation measures should also focus at reducing physical, economic and social vulnerability of the region at the event of the disaster. Cyclone mitigation and preparedness largely hinges on the preparedness of the community. The following steps can be taken to reduce the risk in the unfortunate event of the said natural disasters.

- Restore Communication networks
- The task force in association with Search & Rescue Teams of Police and Fire should thoroughly search the affected area for survivors and injured.
- In case of heavy flooding and inundation, vehicular access may be restricted and hence suitable rafts/boats should be used to rescue and evacuate the people affected by the floods.
- The waterlogged in low lying residential areas should be pumped out and the pumped out water could be let through the nearest natural drain or canal. Also, fire engines can be deployed to pump out water from affected areas during emergencies.
- Any breach in rivers, streams or natural drains should be protected with adequate sandbags or creation of temporary embankments to avoid further damage to property and human life.
- In case of heavy storms, power supply to areas which are in the primary path of the storm can be disconnected to avoid hazards due to breakage of power lines. Provisions should be made to provide generators for temporary power supply to storm affected areas.
- Relief camps should be opened in appropriate locations where a large number of people are affected.
- Health facilities like General hospitals and Medical Colleges should be ready to accept crowd in case the primary health centers gets overcrowded.

9.4.3 RESPONSE PLAN

Response measures are those taken immediately prior to and following disaster impact. It is important to have clear organization structures with established line of authority within the government mechanism to handle the response plan in case of natural calamities. The plan should detail out the various phases from early warning to rehabilitation and the roles that agencies play in reaching the vulnerable and affected to identified disaster support infrastructure located in the Dibrugarh Region. Response plans include formation of functional teams and providing plans for transportation, evacuation, search and rescue, and rehabilitation. They are supported by supervisory zone-based teams assuring food, shelter, water, medicine to the vulnerable to uphold physical and psychological health. Survey and assessment should be the part of response activity.

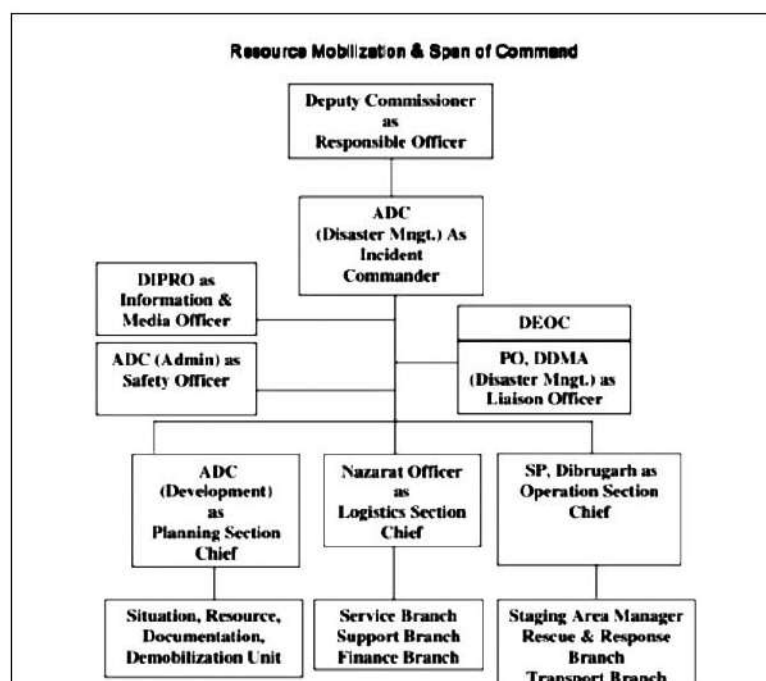


Figure 166 Resource Mobilization during Response

Table 224 Disaster Response Plan for District Level

Sl. No.	Response at district level	
1	<p>On receipt of Flood Warning, DDMA will pass the information for taking necessary measures to:</p> <ul style="list-style-type: none"> The concerned SDO (Civil) Revenue Circle Officer Suptd. of Police Executive Engineer WR Dept. Executive Engineer, PWD(Roads) Station Officer-Fire Service Station and I/C of State Disaster Response Force (SDRF)/National Disaster Response Force (NDRF) if stationed in the district. Deputy Director, F&C Supplies Jt. Director Health Services District Veterinary Officer to take necessary measures so that if necessary, assistance can be provided in short notice to the affected areas DIPRO, if requires giving public announcement for evacuating people from vulnerable areas 	Deputy Commissioner (DC) will direct Addl. DC or CEO, DDMA
2	SP will instruct Senior Station officer, Fire and Emergency Services/SDRF to assist the Circle Officer in rescue, evacuation and relocation processes	Superintendent of Police (SP)
3	Senior Station officer, Fire and Emergency Services will mobilize teams of SDRF and boats available in their custody and coordinate with DDMA/Circle Officer for response.	Snr. Station officer, Fire and Emergency Services
4	Executive Engineer, WR Dept. shall mobilize man material to strengthen weak embankment, keep constant vigil on Water Levels & and take necessary temporary measures to avert any breaches in embankments.	Executive Engineer, WR Dept.
5	Take adequate measures to ensure that the road communication is not disrupted; repair any breaches on roads for evacuation and supply of relief to the affected people.	Executive Engineer, PWD (Roads)
6	Jt. Director Health Services on receipt of information will initiate to mobilize medical response team, ambulances and alert all government hospitals in the area likely to be affected. JD shall also direct SDMHO and I/C PHC of the concerned area to form a team of doctors equipped with necessary medical equipment and move to the affected places or Relief Camp/centre as required by the Circle Officer	Jt. Director Health Services
7	Take periodic report of the situation and instruct Circle Officers, Jt. Director Health Services, Executive Engineers of PWD (Roads), PHE, WR, Irrigation, Police, Fire & Emergency Services to take necessary measures as required for dealing with the situation	Deputy Commissioner
8	Deputy Commissioner will also inform State HQ about the prevailing situation and actions taken	Deputy Commissioner

Table 225 Disaster Response Plan for Revenue Circle Level

Sl. No.	Response at revenue circle level	
1	On receipt of warning, mobilize the Lot Mondal, Gaon Burah, SDRF and other agencies and resources available under Circle Officer's jurisdiction	Circle Officers (COs) of the concerned Revenue Circle
2	Go to the specific location immediately and inform the villagers on the probability of any flood event and ask them to take necessary precautionary measures	Lot Manadal and Gaon Burah, Field Officer (Disaster Managment)
3	In case of probability of high intensity flood, evacuation of people from vulnerable areas to pre-identified safe locations and preposition of quick Response Team/SDRF/NDRF/Police Force/Sand Bags/ Boats/Tarpaulin/ Tents)	Circle Officers (COs) of the concerned Revenue Circle, Inland Water Transport (IWT) Dept.
4	Keep DC/SDO (Civil) informed on an hourly basis about the situation on the ground level and may request additional resources of man, material and machines if required from DC or SDO (Civil)	Circle Officers (COs) of the concerned Rev. Circle
5	Inform: <ul style="list-style-type: none"> Block Development Officer (BDO), so that BDO can inform PRI representatives for appropriate action GP Secretary and GP President for appropriate action 	Circle Officers (COs) of the concerned Revenue Circle
6	Open Relief Camps if required and give requisition for GR to DC	Revenue Circle Officer
7	Arrange for distribution of Relief	Revenue Circle Officer

Coordinated IEC activities should be initiated well in advance.

- Mock drill of preparedness should be carried out twice in a year. The mock rehearsal should start from the Control Room. This will help in finding out the preparedness level for the district level functionaries.
- Make separate plan of operation and list of required materials, tools machineries for each kind of disaster.
- Train the rescue forces with the equipments and specialize them for the different types of disaster by the experts.
- Train the Panchayat leaders / village volunteers/ Villagers for helping the affected people for the disaster of their concern.
- Half yearly review the stock of men, materials, and machineries of all lined departments.
- Approach to NDMA and ASDMA for any kind of assistance to the line departments for up-keepment of their machineries and strengthening the resources.
- Warning system through Police Control Room (24x7) DDIPR/AIR/DIO.
- The Incident Command Officer shall organize regular coordination meeting with all DM Committee Members, Head of office, Public leaders, NGO and senior citizen in consultation with the Chairman.
- The Incident Command Officer will liaise with all Head of office, NGO, Public Leaders and other organizations to keep their machineries and manpower in readiness to face occurrence of any type of natural disaster.
- The Incident Command Officer shall keep record of all parameter which might
- indicate occurrence of any type of natural disaster and intimate the concerned higher authority in weekly / daily basis.
- The RRTs (Medical & Police) will be alerted by the Incident Command Officer.

Flow chart showing the directional of information flow at DEOC

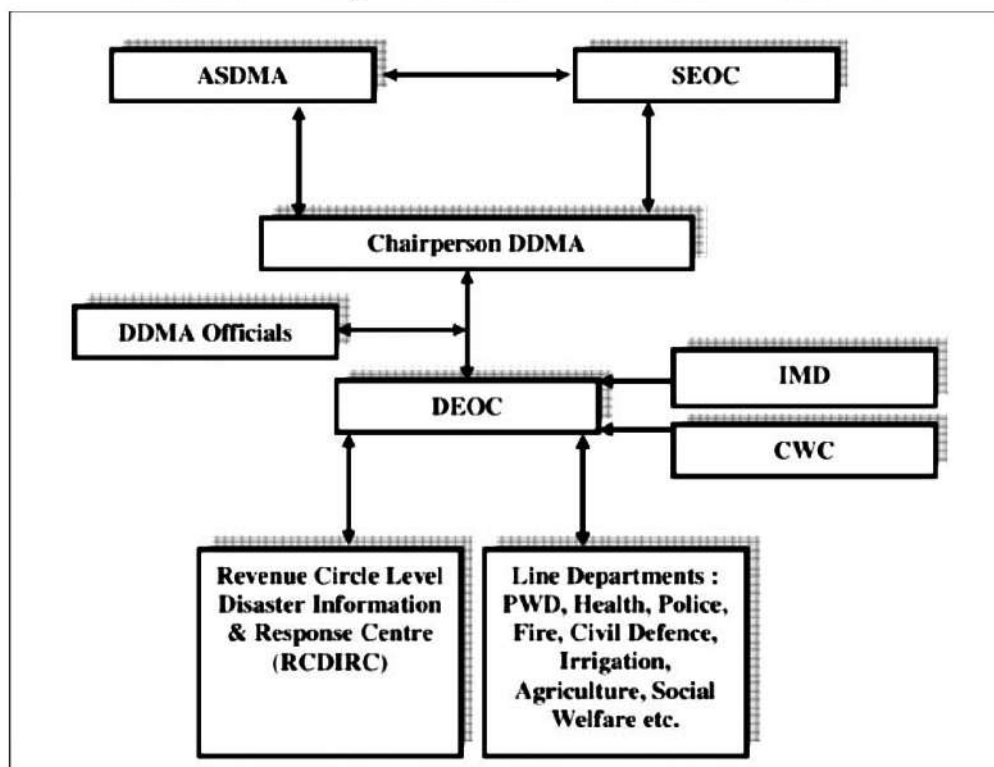


Figure 167 Disaster information flow chart

9.4.4 RELIEF PLAN

9.4.4.1 During the Disaster.

- Disseminate the warning of disaster from DDR&IC to all concerned destination in single attempt by using mass sms, announcement through radio, through mass voice mail and ask the people who are likely to be affected, to take shelter in safer places.
- Immediate deploy the forces to clear the route of search & rescue and also to clear the traffic from the route of rescue.
- Command to the forces, NGO, SHG & volunteers to rush immediately to the affected area for search and rescue with all pre-enlisted tools and equipments for disaster.
- During the time of occurrence of disaster, the Nodal Officer shall liaise with all Head of office, Public Leaders and others organizations and initiate prompt measures to prevent loss of human lives and property damage.
- The Nodal Officer shall initiate immediate necessary measure for evacuations, organize Search and Rescue teams with consultation with the concerned Member which have been entrusted to this work.
- If necessary, the Nodal Officer will initiate setting up of Relief Camp for the affected people in a safer place and ensure proper supply of safe drinking water, electricity, medical facilities and rations etc. with the help of concerned departments to the relief camp.

9.4.4.2 Post Disaster:

- A Post- disaster evaluation should be done after the withdrawal of relief and rehabilitation activities in order to assess
- The nature of state intervention and support,
- Suitability of the organizational structure,
- Institutional Arrangements,
- Adequacy of Operating Procedures,
- Monitoring mechanism,
- Information tools,
- Equipments,
- Communication System, etc.

The impact studies on the aforesaid operations for long term preventive and mitigation efforts are to be undertaken. Evaluation exercises may be undertaken to understand the perceptions about disaster response in terms of

- Adequacy of training
- Alert and warning system,
- Control Room functions,
- Communication plans,
- Security,
- Containment,
- Recovery procedures,
- Monitoring

9.4.4.3 Relief and Rehabilitation Plan for Flood

Table 226 Relief and Rehabilitation Plan for Flood

Sl. No.	Floods	Deputy Commissioner/ DDMA
1	Pre-Flood	<ul style="list-style-type: none"> • Maximum number of relief centres likely to be set up Facilities to be available at each centre • Maximum likely number of relief parties The way individuals and voluntary organizations are to be associated with the relief teams. • The way Panchayats will be associated with relief operations. Divide the district into compact zones each comprising a group of villages falling under both 'very vulnerable' and 'vulnerable' areas as classified in DDMP and each such zone shall be serially numbered Select sites for evacuation centres and relief centres in safe areas. The site for sheltering livestock may be decided in consultation with the district A. H. & Veterinary officer. In selecting sites, preference shall be given to high lands, schools, marketplaces, and places not likely to be inundated. • Make a rough estimate of requirements Prepare • A sub-division wise list of officers and staff available for deployment of relief duty as and when called for. • A list of jeeps, buses, trucks and other vehicles for requisition in case of necessity, in consultation with the D.T.O.
2	During Flood	<ul style="list-style-type: none"> • DDMA will conduct weekly meeting to review flood management during the flood season. On receipt of flood warning D.C will: take action as per Standard Operating Procedure (SOP) prepared by the State On occurrence of Flood the DC will: visit the places of occurrence, ascertain the nature and extent of flood and make prompt operational decisions, DC will arrange proper distribution of relief articles received as donation in kind among the deserving affected people through the official and non-official agencies • DC will arrange for taking care of the infirm, destitute, orphans, children, and expectant/nursing mothers in the relief centres through the assistance of the distribution social welfare officer.
3	Post Flood	<ul style="list-style-type: none"> • DC will collect agricultural statistics from the revenue staff and the district agricultural officer about areas under crops affected by flood, damage to crops and the number of cultivators involved. • After the flood recedes, a report on losses and damages of each area needs to be submitted the Government in the Revenue & Disaster Management Department in the form as given in Appendix X of Assam Disaster. • Generally, full pictures as to the 35 duration of relief measures will emerge as soon as the waters have subsided. In declaring closures of relief operation, he will take the approval of the divisional commissioner and inform all concerned.

9.4.5 RECOVERY

In the unfortunate event of a natural calamity like a cyclone or flood its important focus on the methods and activities to restore lifeline support physical infrastructure like adequate water supply, power and communication networks, accessibility to the site. These must be the described in the disaster management plan- relief & recovery part. In the river side of the Dibrugarh area the communities are depended on the specific infrastructure for their livelihood, and these should be identified and methods to restore them in short/medium/long term have to be identified and respective funding reequipments have to be made available and followed by speedy decision-making process.

In the District, the Nodal agency plays direct and active role in relief. The Deputy Commissioner office either directly or through assistance will inform to the nearest police stations, WT stations, administrative officers and nodal agencies at Circle, Sub-Divisional and Dist. HQ by quickest means. For timely assistance to the people affected by natural disasters it is necessary to have correct assessment of extend of damage to crops, public & private properties and loss of human lives and livestock. The emergency relief measures and relief measures in the aftermath of a disaster is generally carried out in compliance with Calamity Relief Fund Norms by Deputy Commissioner.

The task force is responsible for collecting the extend of the damages with respect to number of houses damaged, loss of human lives, number of person injured, information about individual families, their income, property and assets. The zonal officer has to prepare a report on the same to be sent to the Deputy Commissioner. The mentioned assessment is to be carried out on priority basis so that the Nodal Department in the district Region which is the Department of Disaster Management can extend relief assistance in time in order to mitigate the effect of the natural disaster.

9.4.6 DEPARTMENT ROLES AND RESPONSIBILITIES

9.4.6.1 Police department:

In order to achieve smooth and orderly evacuation of human lives and properties the district Police Department has to play vital role. The Police Department will keep close liaison with Deputy Commissioner/ Addl. Deputy Commissioner (Disaster Management) and the District Emergency Operation Centre (DEOC). The Superintendent of Police will chalk out action plan forming different zones and sectors with Police Zonal & Sector Officers for smooth conduct of rescue and relief operation. The Zonal and Sector Police Officer will keep close liaison with the District Headquarter as well as concerned departments like Fire Service, Civil Defence, Health, Army & Paramilitary, Air Force, Transport, and ensure the following tasks.

- Visit the affected areas and keep informed through wireless system/ telephone etc. about the up-to-date status of the affected areas and prompt actions to be taken for rescue and relief operations.
- Take adequate care for maintaining law & order. They also assist the Civil Administration in times of Disasters
- Round the clock vigil of the area including the high and vulnerable buildings and ensure rescue operations at every affected areas/houses
- Requisition of services of Civil Defence, Homeguards/VDPs and other military/ paramilitary forces in rescue operations 21
- Provide assistance to the community for shifting of affected and injured persons to the health camp for medical treatment.
- Extend support to Fire & Emergency Services in controlling fire incidents and security to individuals and public properties
- Establish emergency communication system
- Extend support to Civil Administration in management of dead.

9.4.6.2 Fire & Emergency Service

Fire (natural as well as manmade) is one of the major disasters that causes loss of human lives and property. Sometimes not because of earthquake, but because of fire people lose their lives

- Ensure that proper fire fighting precautions has been taken while issuing permission for construction of buildings.
- Make sure that smoke detectors/ fire fighting equipment are installed in all important places like Govt. offices/ schools/ colleges/ cinema halls/ industrial units and other installations where the people gather in large number. Also train up employees about the techniques of using fire fighters
- Make sure that sufficient number of fire tenders with all equipments in working condition are available round the clock.
- Train up/ Motivate people how to use fire fighters and its advantages.
- Carry out Fire Mock Drill in schools/ public places/ apartments etc. to raise public awareness.

9.4.6.3 State Disaster Response Force Services

Sometimes not because of fire, but because of flood/earthquake etc. people lose their lives. SDRF People will be in alert mode with all lifesaving equipments/ boat and extend their services as and when required. The will work under the command and control of Sr. Station Officer, Dibrugarh Fire & Emergency Services Station.

9.4.6.4 Civil Defence & Home Guard:

For effective operation, works of various services, personnel must have proper training and discipline with a view to achieve this intensive training with special reference to the earthquake disaster should be arranged to train up the volunteers and 23 other related personnel as well as the public. The efficiency in performance of the various services depends highly upon the amount of training imparted to them. In Civil Defence towns, training with special reference to earthquake are already introduced in educational institutions. It is suggested to conduct some exercises by Civil Defence department, in the rural areas to enlighten the public and students for their action and part played in a disaster. The existing Civil Defence Organization of Duliajan and Namrup will play their role as per scheme of Civil Defence in case of Earthquake disaster. Civil Defence Department will keep a register of trained volunteers so that their services can be utilized in disaster relief operation in respective service. The Deputy Controller of Civil Defence, Dibrugarh will properly maintain the equipments necessary for conducting rescue operation to extricate the casualties trapped from under debris. He will also ascertain the resources of manpower and materials available with the local Agencies like Home Guard, and other Local voluntary organization such as Indian Red Cross Societies, N.C.C., and Scouts & Guides Etc. Civil Defence and Home Guard, Dibrugarh will have to prepare a separate contingency plan for this purpose. They need to spare sufficient numbers of Home Guards for emergency operations as and when called for.

9.4.6.5 Health Department:

The Health Department will make necessary arrangements for blood banks and other lifesaving emergency services. All Civil Hospitals and The Assam Medical College should be on alert. One senior Doctor for emergency duty should be detailed on a round-the-clock basis in the Casualty Ward in these Hospitals. Ambulances with life saving drugs need to be kept in readiness. An inventory of all private ambulances should be prepared along with the names of the drivers and their contact phone numbers.

- Provide health and medical care in normal and disaster situations
- Develop adequate health infrastructure in the district and implement programmes towards improvement of health across all sections of the society

- Conduct vulnerability assessment of all health facilities across the district and undertake preparedness and mitigation measures
- Render immediate medical service and transport casualties to hospitals
- Activate Hospital Disaster Management Plan including mass casualty plan
- Prioritize patient management; Activate triage system as per the established protocol
- Set-up relief camps from District to PHC Level, Medical Colleges.
- Establish a base for field hospitals along with basic/support services
- Maintain Ambulance network
- Establish network among medical practitioners/ health institutions to facilitate quick mobility of Doctors and mass casualty management
- Ensure that emergency communication is functional at all times, including medical services (pharmacy, blood bank, paramedics, ambulance services)
- Conduct training to Hospital Administrators, Doctors, Nurses, Paramedics, and other staff
- Work towards developing a cadre of volunteers trained in basic first-aid
- Provide support in recovery operations
- Carry out impact assessment on health infrastructure
- Provide support to line departments in Recovery and Rehabilitation efforts of the communities
- Provide expert counselling/psychosocial support to disaster survivors
- The principal of the AMC&H Dibrugarh will keep few beds ready for treatment of the referred cases. He will help with manpower and medicines, vehicles and voluntary Blood Donors.
- Document actions taken by the department and incorporate lessons learnt in the sector plan.

9.4.6.6 Public Works Department:

Structural safety of all existing RCC, Steel and masonry buildings needs to be assessed with regards to its safety against potential hazards like earthquake, floods, fires and accidents. The PWD (Bldg.) division has to prepare and provide checklist for regulatory and development authorities

- The PWD (Bldg.) division has to identify vulnerable buildings for seismic safety in compliance with Govt. of India guidelines. They has to create, compile and maintain a database of all weak structures (Govt./ Non-Govt. and lifeline buildings) and provide technical support for the corrective measures to follow like retrofitting/demolishing of such structures.
- The PWD (Bldg.) division will provide technical assistance to the DDMA for enforcing BIS codes/ Assam Notified Urban Areas (Other than Guwahati) Building Rules, 2014 to the extent applicable in the district. The DDMA may take necessary actions against deviation/ violation of such resistive measures.
- PWD (NH) & PWD (State Roads) will make an inventory of the machineries like Bulldozers, Excavators, Cranes etc. necessary for restoration of roads.
- Construction and repair of roads, bridges, culverts in the district
- The departmental Engineer should keep vigilance on the NH and all other important road during and immediately after the earthquake and take immediate measures to clear the blockade found anywhere

using the required machineries like bulldozers etc.

- Preposition emergency supplies and equipment/tools in high-risk concentration areas
- Establish mitigation funds within the department²⁶
- Undertake damage assessment of lifeline infrastructure; Prepare estimates and undertake repair/strengthening works; Supervise the civil work activities and ensure safe construction practices are streamlined during Recovery/Reconstruction phase
- Conduct training for staff in latest advancements of engineering, demolition techniques, health monitoring of infrastructure assets, seismic strengthening and retrofitting, critical infrastructure protection, DM.

9.4.6.7 Public Health Engineering Department:

Water born diseases are one of the major reasons of increasing the number of death after any disaster. Providing purified water to the affected people is a challenge. The PHE department plays a vital role in this regard. Checklists for this department are as follows,

- The PHE department, Dibrugarh will have to keep sufficient stock of water purification materials like bleaching powder, alum and lime etc. for carrying to the area where necessary and depute their field staff whenever disaster situation claims.
- The PHE Engineer staff will keep in constant touch with the Zonal Officers during and after the disaster.
- Ensure safe hygiene through Total Sanitation Campaign (TSC). Motivate the people to exercise proper disinfections and hygiene practices for drinking water and taking food.
- Undertake risk assessment and management of ground water resources in emergency situations.

9.4.6.8 Water Resources Department:

The Water Resource Department will assess and make a list of vulnerable dykes and keep close eye on these areas. Accordingly, they will have to prepare contingency plan to meet any emergency. The Executive Engineer is to check regularly the condition of the sluice gates and do necessary rectifications, if any, so that stagnant water can be discharged effectively. He is responsible for deploying officials/ experts along the dyke/ bundh etc. during the flood period at the vulnerable points and send their contact numbers to DDMA and zonal officers. The WR Department has to keep sufficient number of empty gunny bags, sand and other facilities in the vulnerable reaches. In addition to this they have to deploy strict vigilance over all the major embankments round the clock.

9.4.6.9 Irrigation Department

The Executive Engineer is to keep sufficient nos. of portable pump sets ready on 24x7 hourly basis. He will arrange sufficient manpower and assign duties likewise.

9.4.6.10 Transport Department:

Proper maintenance/cleanliness of roads during disaster is an important task so that rescue/relief operations, transportation of essential goods & manpower are not affected. A checklist for Transport Department is as under:

- The DTO Dibrugarh will keep list of owners with contact details of all type of vehicles Excavators, Bulldozers, Cranes. Recovery Vans Tractors, buses, trucks etc. which can be arranged immediately during and after any disaster. A copy of the same is to be made available to the District Disaster Management Authority.
- Arrange vehicles for transport of people and relief supplies, navigation aid
- The Transport Department will have to prepare an Action Plan for supply of the all type of vehicles when required. The DTO would have to keep liaison with the DEOC.
- Take up awareness program for road safety (Accident prevention)

9.4.6.11 Food and Civil Supplies Department

They are responsible for proper and quick distribution of Civil Supplies at the time need. They will ensure procurement of essential commodities (controlled & noncontrolled) and maintain buffer stock of sufficient quantities to be released during necessity. They are also to issue instructions to the Roller Flour Mills to keep rolling stock of wheat bran/ rice barn and send regularly a list displaying availability of these 28 items. The F&CS department has to keep constant vigil so that traders do not take advantage of the situation creating artificial scarcity of commodities and inflate prices.

9.4.6.12 Veterinary Department:

Disaster causes death and injury to animals also. The veterinary Department with the assistance of NGOs/ volunteers working in this line will organize in such a way that can expeditiously take steps for rescue of seriously injured animals and disposal of dead animals also. District Veterinary Officer will assess requirement of equipment's and other veterinary staff, medicines vaccines disinfectants etc. and prepare an Action Plan to combat the possibilities of injuries and epidemics etc. They will conduct assessment of damage and economic loss due to disasters within the sector.

9.4.6.13 Agriculture Department:

During flood/draught, loss to seasonal crops is considerable. The Agriculture Department is entrusted with provide necessary technical support to the district administration.

- Establish coordination in implementing and providing technological know-how on drought management to the farming community through agricultural extension services
- Continue educating farmers on soil and water conservation technologies through implementation of watershed projects and know-how of drought resistant crops
- The Agriculture Department will make an assessment of acreage under crops and number of cultivators to be affected in each of the areas.
- They need to assess the requirement of seeds, seedlings, manures etc. for grants, tools and plants for emergency relief works
- They have to advice on the suitable cropping pattern. Arrange for spraying of pesticides wherever necessary.
- Make sufficient stock of seeds, manures, implements etc. and make arrangements for raising seedlings.
- Arrange distribution of agricultural inputs in consultation with the district administration.
- Render technical support to the needy cultivators for salvage and protection of surviving crops
- Repair the damaged tools and plants.

9.4.6.14 Social Welfare Department:

During any disaster the weakest & neglected section of the community viz. women, children, senior citizens, physically handicapped suffer the most. It is the responsibility of our society to protect them.

- The Social Welfare Department has to make arrangement for mobile maternity and child welfare centres wherever necessary
- Access the requirement of baby food etc. and arrange them. They have to extend help for taking care of orphan & mother, and the sick

- Maintain in directory of all social welfare organizations located in the district and made it available to the DDMA
- Alert personnel for floods on receipt of warning and kept constant touch with the district administration All heads of the Departments/Offices will keep constant touch with the District Officials/Disaster Emergency Operation Centre at DC's office. Every department will have to prepare separate Action Plans showing the Standard Operating Procedures (SOPs) to be adopted on emergency and Resource Inventory (human & material) and made it available with the DDMA, Dibrugarh.

9.5 CITY DISASTER MITIGATION PLAN

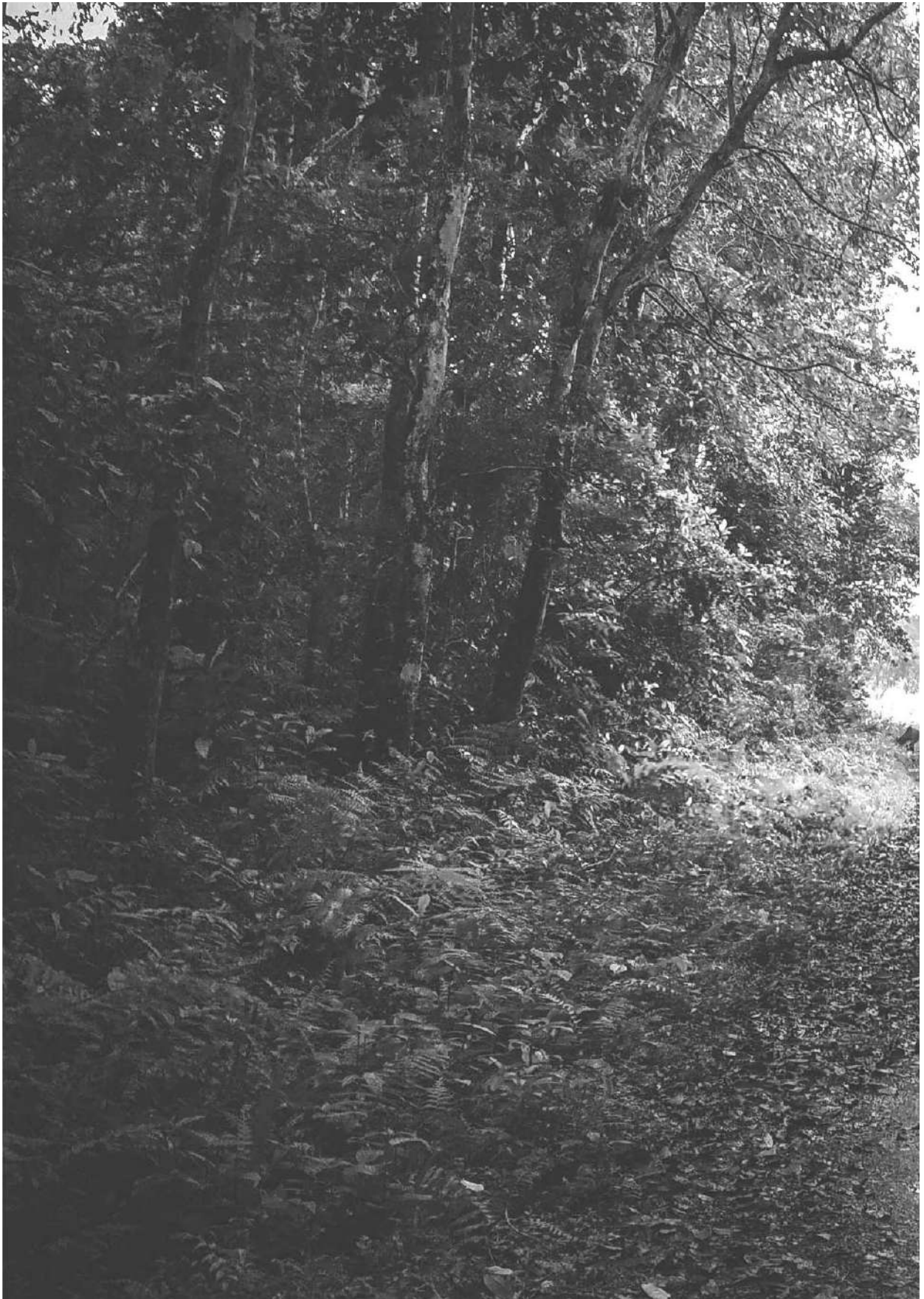
The points mentioned above should be part of a larger city or region level disaster management plan. The Disaster Management Act, 2005 has brought a change from Response & Relief oriented approach to proactive and comprehensive approach. This has encouraged many Indian cities to develop and formulate a City Disaster Management Plan, the same should be worked for Dibrugarh MPA as well to enable it to be better prepared in the case of natural disasters in the future. As part of the Master Plan 2045 the authority feels there is a need for a CDMP for the planning area covering the following general principles: -

- Risk & Hazard Assessment
- Planning
- Organization
- Resource Utilization
- Need for Specialist
- Training

Generally, the CDMP prepared for the planning area should include sectoral plans covering the following aspects of disaster & emergency management: -

- Overall Preparedness
- Rehabilitation
- Emergency Response
- Prevention
- Mitigation
- Recovery
- Reconstruction
- Capacity Building Plans

Based on the above discussed general principles a detailed City Disaster Management Plan (CDMP) for Dibrugarh Planning Area have to be prepared for strengthening the institutional mechanism.



A black and white photograph of a dense forest. A path or stream bed is visible in the lower left, leading into the woods. The trees are tall and leafy, with sunlight filtering through the canopy. The overall mood is serene and natural.

10 ENVIRONMENT

Environment plays an important role in the sustainability of a region. The balance between different environmental aspects and development defines the progress and livability of an area. The most crucial factors which affects the livability of an area are primarily, land and water. With an increase in the demand of the water, the demand for urban land is also increasing. People flock to urban areas to seek employment, entertainment, shopping and generally a higher standard of living. At the same time, environmental infrastructure for works and services are inadequate to serve the resulting increase in population and population densities.

The inevitable congestion causes environmental hazards and degradation until strategies for reversing environmental deterioration can be implemented. Hence, the magnitude of urban population growth in developing countries is a direct indicator of the degree of spatial concentration of people, industries, commerce, vehicles, energy consumption, water use, waste generation and other environmental stresses. Several environmental aspects are considered and studied to access the environmental conditions of the planning area. This analysis is presented in this chapter along with proposed strategies to safeguard the environment of the planning area.

10.1 GEOGRAPHY OF REGION

Geography of Dibrugarh is appositely characterized by various highlands, rivers, flat paddy field, Tea gardens and marshy lands. Geo-morphologically, Dibrugarh District form the shape of a Gun. Dibrugarh District is bounded by Dhemaji District and Brahmaputra River on the North, by part of Majuli, Lakhimpur and Sivasagar District on West, by Sivasagar District on its South, by Tinsukia District on its East.

Geography of Dibrugarh is also determined by the pleasant weather of the region. In fact, it enhances the picturesque topography of this district of Assam. The climate is in general monsoon type. However, there are some differences from the other districts of Assam. The climate is of an extreme type compared to other districts of Assam. The pattern of rainfall is such that the south is usually dry and the north is relatively rainier. Rainfall from south to north increases. The average rainfall in the Dibrugarh is 2618 mm with average relative humidity of 95%. The average annual rainfall of the Dibrugarh in the north is 2760 mm with a total number of 193 rainy days. Rainfall records show a decreasing trend towards east and west of Dibrugarh city. The average rainfall is 26 cm. The months of March, April and May constitute the pre-monsoon season. The norwesters locally called Bordoichilla appears during the period. Rainfall ranges between 59 cm and 160 cm. With the onset of monsoon in early June, heavy rainfall occurs. Widespread low clouds and high humidity together maintain almost uniform temperature over the area. The average annual rainfall during the period is 300 cm.

Physiographically, there is a large tract of Tropical Rainforest in its eastern and southern regions, which is a part of the Dehing Patkai wildlife sanctuary. The MPA is a plain area with occasional highlands, flood plain, beels, swamps and foothills of the Barail Range. The region is flat with a gradual lobe from the East Arunachal hills to the west. The soil of the region is mostly fertile, alluvial soil.

Thus, it is noticeable that geography of Dibrugarh District is spread over vast plain lands dotted with fewer hilly terrains. The wonderful climate enhances the topographical features of the region.



10.2 RIVERS

Urbanization has got its own advantages and disadvantages. The main advantage is that it provides scope for provision of common infrastructure facilities. The main disadvantage is that it creates more strain on the natural resources (including land and waterbodies). The environmental consequences of urban growth are considerable. Cities are prolific users of natural resources and generators of wastes. The urban ways of living contribute to relatively more pressure on resources. Migration of people to riverbank creates scattered clusters of settlement which puts enormous pressure on the available water resources. Some of the issues will be water scarcity and water pollution, air pollution, climate and Heat Island Effect, poor management of solid wastes, urban congestion etc. in the system.

Dibrugarh is a geographically potential as three rivers pass through entire Master Plan Area. Brahmaputra on North, Sessa from Middle and Burhi Dihing from South.

10.2.1 THE BRAHMAPUTRA RIVER

The river originates from the Kailash ranges of Himalayas at an elevation of 5300 M. After flowing through Tibet it enters India through Arunachal Pradesh and flows through Assam and Bangladesh before it joins Bay of Bengal. The average width of Brahmaputra is 5.46 Km. The average annual discharge is about 20,000 cumec and average dry season discharge is 4,420 cumec. The river slope is very steep till it enters India. A drop of about 4800 M is achieved in a length of about 1700 Km in China (Tibet). This average slope of about 2.82 m/Km gets reduced to about 0.1m/Km in Assam valley. Due to this sudden flattening of river slope, the river becomes braided in nature in the Assam valley. During its course in Assam valley from Kobo to Dhubri the river is joined by about 20 (twenty) important tributaries on its North bank and 13 (thirteen) on its South bank. Joining of these tributaries bringing high sediment load activates braiding. All the tributaries of the valley area are rain fed and foam up with rain. The precipitation here is mainly due to South West monsoon. Heavy precipitation occurs here from May to September. It travels a distance of 750 KM throughout the entire state of Assam.

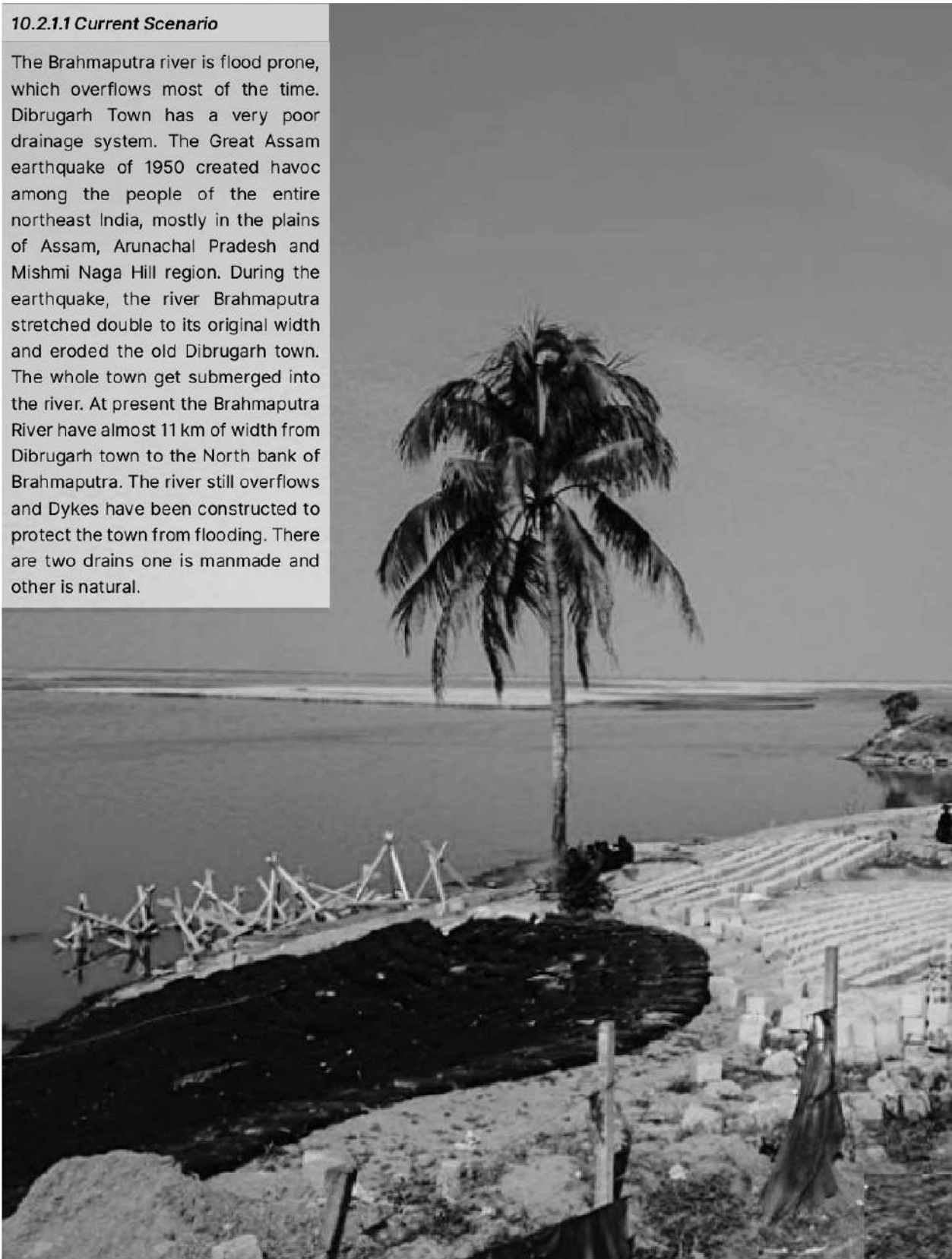
The Brahmaputra River basin hosts very rich and unique biodiversity. The whole of north-eastern region is a globally recognized bio-diversity hot spot. In the Indian territory the total forest cover of the Brahmaputra basin is 1,14,894 sq. km. which is 54% of the total basin area. In the distribution of forest cover among 6 states in Brahmaputra basin, Arunachal Pradesh tops the list with 82.8% forest cover, but it is sad that the highest number of hydro-electric dams are planned in this state inviting disastrous impacts for the biodiversity, forests, people, and environment. The tally of rest of the five states is as follows – Nagaland (68.9%), Meghalaya (63.5%), Sikkim (38.1%), West Bengal (21.4 %) and Assam (20.6 %). Brahmaputra is a huge river. In some places of Assam it is close to 10 kilometres wide and looks more like a sea than a river.

The Brahmaputra is very wide and braided in the district of Dibrugarh. Sunrise and Sunset at the river are worth watching at many places across Assam. Dibrugarh being present very close to Brahmaputra provides great views of the river which are worthy to watch.

Brahmaputra river basin is known to be very prone to flood and erosion and these two hazards have led to many problems in the basin. In India, out of the eight north-eastern states, Assam faces the most severe brunt of flood and erosion. Both flood erosion has been severely affecting the economy as well political, social, and cultural milieu of Assam.

10.2.1.1 Current Scenario

The Brahmaputra river is flood prone, which overflows most of the time. Dibrugarh Town has a very poor drainage system. The Great Assam earthquake of 1950 created havoc among the people of the entire northeast India, mostly in the plains of Assam, Arunachal Pradesh and Mishmi Naga Hill region. During the earthquake, the river Brahmaputra stretched double to its original width and eroded the old Dibrugarh town. The whole town get submerged into the river. At present the Brahmaputra River have almost 11 km of width from Dibrugarh town to the North bank of Brahmaputra. The river still overflows and Dykes have been constructed to protect the town from flooding. There are two drains one is manmade and other is natural.





Brahmaputra Dike, Embankment View

10.2.1.2 Polluted River Stretch

The length of the polluted stretch of Brahmaputra river is 373 kms out of 750 kms of the total stretch (Fig 168) and the stretch identified as polluted is from Bogibeel to Sualkuchi. The entire stretch of Brahmaputra river covers eleven (11) monitoring locations under NWMP. However, the BOD level was found to be exceeding 3mg/L in only six (06) monitoring stations on few occasions.

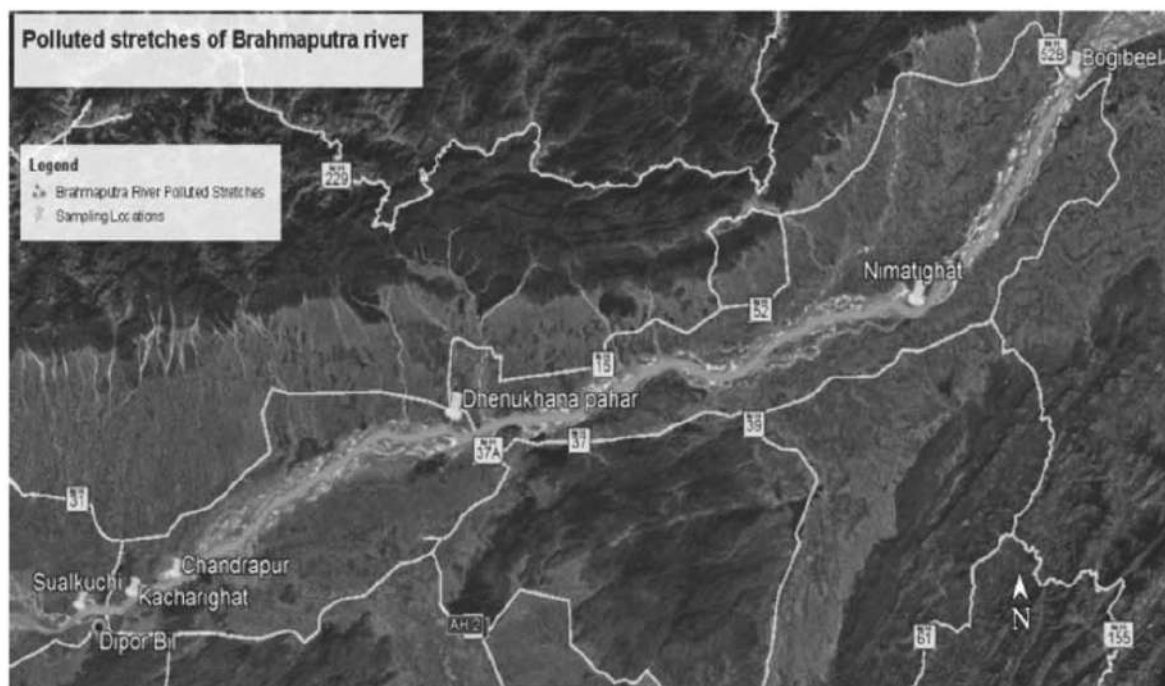


Figure 168 Polluted Stretches in Brahmaputra River

10.2.1.3 Identification of Major Locality around riverbank

Dibrugarh is one of the major towns located on the bank of the Brahmaputra River. The approximate population of the Dibrugarh town is 1.54 lakh as per Census 2011. The major localities identified in and around the catchment areas of polluted stretch of Brahmaputra River at down streams of Dibrugarh Town are

a) Bogibeel: Dibrugarh is the major town located in the bank of river Brahmaputra at around 18 kms upstream of the sampling station. Medium sized villages viz: Bogibeel gaon, Lengapathar gaon, Hapekheti gaon and Walkhabi gaon no.1 of Dibrugarh district and Kareng gaon, Garmara Chapori, Dambuk kalabari, Merchapori and Amguri bali of Dhemaji district under Sissiborgaon tehsil are situated in the catchment of the Bogibeel polluted stretch.

10.2.1.4 Quantity of Sewage generated

There are no existing STPs located in the towns and cities. The aggregate sewage generated from the localities and towns are 385.14 KLD at Bogibeel polluted stretch.

Source: Action plan for Brahmaputra River, PCB, Assam)

10.2.1.5 Sewerage Treatment Proposal

As per the survey done, one (01) number of STP has been proposed at Dibrugarh town in consultation with the District Administration.

Table 227 Sewerage Generation Calculation

Sr. no.	Area	Population	Water Consumption (KLD)	Sewage Generation (KLD)	No. of STPs proposed	Existing Treatment capacity (KLD)	Gaps in KLD
1.	Bogibeel gaon, Lengapathar gaon, Hapekheti gaon and Walkhabi gaon no.1 of Disbrugarh at Bogibeel stretch	1271	171.6	137.3	01	Nil	137.3
2.	Kareng gaon, Garmara Chapori, Dambuk kalabari, Merchapori and Amguri bali of Dhemaji district at Bogibeel stretch	2295	309.8	247.84	0	Nil	247.84

(Source: Action plan for Brahmaputra river, PCB, Assam)



10.2.1.6 Water quality of polluted stretches of Brahmaputra River

The detail analytical data of the polluted stretches of Brahmaputra River for the month of February 2020 (Bogibeel) are presented further in table 228.

Table 228 River Water Quality Parameter

Sl. No.	Parameter	Bogibeel (Feb 2020)
1	D.O. (mg/L)	7.2
2	pH	7.4
3	Cond (μ S/cm)	140
4	OD (mg/L)	1.8
5	COD (mg/L)	6.5
6	NO ₃ - N (mg/L)	0.4
7	TSS (mg/L)	60
8	Turbidity (NTU)	4
9	p-Alkalinity (mg/L)	Nil
10	m-Alkalinity (mg/L)	44
11	Hardness (mg/L)	46
12	Calcium as CaCO ₃ (mg/L)	30
13	Magnesium as CaCO ₃ (mg/L)	16
14	Chloride as Cl (mg/L)	6

(Source: PCB, Dibrugarh, 2020, Assam)

The above data indicates that the BOD load is above 3 mg/L only at eleven (11) occasions out of two hundred sixty four (264) samplings carried out from Jan 2016 till March 2020 in the above stations. It was observed that the BOD value was found to be within permissible limit during the last two years at all locations of Brahmaputra River. Based on water quality monitoring reports of the last 2 years, it is observed that the river Brahmaputra does not have polluted stretches at present. Since the river has high volume and discharge, it has the phenomenon of self-purification which is constantly taking place and hence no actions for rejuvenation of the mentioned river stretches of Brahmaputra River may be required.

10.2.1.7 Drains contributing to pollution

Poor drainage in Dibrugarh is an age-old problem. The entire drainage system is based on the Dibrugarh Town Protection (DTP) drain constructed in 1955-56. Encroachment and siltation of this primary drain plus dumping of garbage has made the drain incapable of effectively draining the town. With an ineffective primary drain, the connecting secondary and tertiary drainage systems become in-operative with resultant public health. DTP drain started at Jalan Nagar, it originally had an outfall at Naharani/ VBogibeel area with a length of 22.4 km. But, due to siltation at the mouth of the drain it was later linked with the Laura Jamira drain which ultimately discharges to the Sessa river that eventually flows into the Brahmaputra. Total length of the drain, including the Laura Jamira drain, is 32 km.

The Dibrugarh Town Protection (DTP) Drain which runs through the heart of the Town meets Rajabheta Jan at a distance of 5 km. from the town. During the rainy seasons and heavy showers, the drain overflows. A second drain carries water from East-West and central Chowkidinghee and Santipara area to the DTP drain. On the Brahmaputra the fluctuations in river levels begin towards the end of March or early part of April, when the Himalayan snow begins to melt. From this period onwards the Brahmaputra River levels records a series of "pumps" or rises for short duration till the end of April, when a more defined rise is felt and in early May, the first flood rises are experienced. As a general rule the first big rise is of short duration and does little harm

to the land or early cultivation. By early June the southwest Monsoon registers its arrival in the Assam Valley and with the continuous heavy rain, river levels rise rapidly, and the Brahmaputra remains in flood condition, registering a series of peak flood levels till October. The Brahmaputra has been the main determinant of flood in the district of Dibrugarh. Due to increase of the water level of this mighty river Brahmaputra and also of the river Buridihing inundation of the catchment areas of the river causes flood.

The Dibrugarh Town is protected by Water Resources dyke which was constructed in three phases in the fifties, protecting the district right from the Oakland Tea Estate upstream to Dehingmukh gaon in the downstream.

10.2.1.8 Ground Water Quality

The water quality of Assam is found to be well within the permissible limit for drinking, irrigation and industrial purposes. Slightly higher content of iron in some sporadic patches of the area are observed, hence water needs to be treated before being used for drinking purpose. Also fluoride content is found to be exceeding permissible limit in few pockets of the state. As per the data generated from PCBA, the ground water quality around the catchment area of polluted stretch of the Brahmaputra River is found to be within the permissible limit and safe for domestic and irrigation purposes.

Table 229 Ground Water quality of catchment area of Brahmaputra River

Sl. No.	Parameter	Bogibeel (Feb 2020)
1	D.O. (mg/L)	7.2
2	pH	7.4
3	Cond (μ S/cm)	98
4	BOD (mg/L)	1.5
5	COD (mg/L)	4.8
6	NO ₃ - N (mg/L)	2.6
7	TSS (mg/L)	8
8	Turbidity (NTU)	2
9	p-Alkalinity (mg/L)	Nil
10	m-Alkalinity (mg/L)	88
11	Hardness (mg/L)	30
12	Calcium as CaCO ₃ (mg/L)	20
13	Magnesium as CaCO ₃ (mg/L)	10
14	Chloride as Cl (mg/L)	8
15	Sulphate as SO ₄ -2 (mg/L)	4.6
16	Phosphate as PO ₄	0.06
17	Total Dissolved Solids (mg/L)	64
18	TFS (mg/L)	18
19	Fluoride (mg/l)	0.33
20	Boron (mg/l)	0.010

(Source: PCB, Dibrugarh, 2020, Assam)

10.2.2 THE SESSA RIVER

River Sessa is a tributary of The Brahmaputra River. After bifurcating from Arunachal Pradesh it enters Dibrugarh from the east. It crisscrosses the DMPA from middle and flows towards west and finally coalesces to Brahmaputra.

River water is undeniably one of the most important sources for survival of people residing near Sessa river. There are various functional uses of river water. Most people settled in surrounding to riverbank were engaged in fishing which was their source of livelihood (50 per cent). The old tradition practice of fishing passed from one generation to the other. The condition of these fisherman was good prior to the setting up of BCPL as they received a good price for their sale. River water was also used for drinking (21.08 percent), bathing (12.04 percent) and washing clothes (15.06 percent).





Sessa River, Bishnu Jyoti Bridge

10.2.2.1 Current Scenario

After the functioning of BCPL, there had been changes in the quality of the river water with its progressive deterioration as industrial waste has been dumped in the river. Earlier the river water was very clear but now some greasy sticky foams can be seen floating. The water in the river had turned a strange brown-black hue and there is suffocation in the odour. The plants emerging from water have turned out brownish- black in colour and the smell of kerosene made it impossible for them to use for consumption purposes. People had stopped using river water for washing clothes as it turned white clothes dirty and shady. Sessa river's fishes were once considered to be a good quality and there was a great demand for the Sessa fish. The various fish species found were Giant river cat fish (Arii), Indian butter cat fish (pabhoh), Magur, Freshwater shark (Barali), chital fish, Rohu (Rau), Day's mystus (Singarah) etc. Fish that used to fetch them thousands of rupees was now sold at hundreds.

Skin diseases like scabies and lesions are affecting the people living in its vicinity. The symptoms of these diseases are intense irritation at night, increasing nervous tension, fatigue, lack of concentration, impairment of efficiency and eventually loss of working time. They also suffer from prolonged loss of sleep due to intolerable noise and foul smell from the plant. They have also been suffering from stomach ailments, headaches and respiratory problems⁶.

10.2.2.2 Polluted River Stretch

No stretch of Sessa river is found polluted within Dibrugarh Master Plan Area, however the length of the polluted stretch of Burhi Dihing river at Lezai area is 3.1 km (approx.). The Lezai- Kolakhowa area consists of two Panchayats (Primary tier of Rural Local Self Government) i.e. Lezai panchayat and Kolakhowa panchayat. These are the immediate adjacent areas of the BCPL plant. The inhabitants of these two areas are mostly scheduled caste and scheduled tribe people and their primary source of income is fishing. Thus, the pollution and contamination of the river water of the Sessa directly impacts the people of the Lezai-Kolakhowa area.

10.2.2.3 Identification of Major Locality around riverbank

Dibrugarh is one of the major towns located on the bank of the Sessa River. The approximate population of the Dibrugarh town is 1.54 lakh as per Census 2011. The localities identified in and around the catchment areas of polluted stretch of Sessa River are villages of Lezai-Kolakhowa area- Bordoibam, Dewanbari Gaon No.1, Dewanbari Koibarta Gaon No.1, Dewanbari Koibarta Gaon No.2, Lezai Gaon, Lezai Miripathar, Lezai Matak Gaon No.8., Pani Gaon No.1, Kolakhowa Gajai Gaon, Sessakuch No.1. Sessa Kuch No.2, Sessakuch No. 3.

The strategic location of the BCPL plant has been a reason of difficulty for the river side people. Even before its inception, during the land acquisition process for the project, 500 families have lost their residential plots and farm lands. Adding to this, after its commissioning the BCPL residues and wastes are being dumped in the Sessa river, because of its proximity and lack of other alternative dumping areas which has converted the Sessa river to almost into an abandoned river. Infact the Sessa River has turned into a 'Bane from a Boon'. Thus, it can be safely concluded that the strategic location of the BCPL plant have contributed in creating livelihood security related problem. Because it is located amidst areas which are vastly populated and is adjacent to a river, which hitherto have been providing livelihood assets to the people living in the villages situated in the river bank, the BCPL has become a cause of distress for the people for the people have been located in some isolated or secluded area far from residential places and natural entities river, it could have less affected the people and the environment⁷.

10.2.2.4 The issue of staking livelihood security of the affected families

As mentioned in the forgoing sub section, the wastes of BCPL plant are dumped in the Sessa River leading to the pollution of the river water and affecting the lives of the fishing community. Because, almost majority of the people of the surrounding locality are dependent on the river water for their livelihood, thus their livelihood security is not only in stake but also in danger. The negative impact of BCPL plant has grossly affected the people of surrounding village area, specially the fishing community is under clouds of an unseen and insecure future. Though, the BCPL was expected to generate production, creating income avenues and the people living in the adjacent areas of the plant were very much hopeful of getting secure jobs before its establishment but in reality the plant has become a threat even for their settled parental occupation from which they hitherto were getting their source of income. Infact, as an immediate effect, the BCPL is directly impinging on the livelihood security of the fishing community. After the commissioning of BCPL plant, wastage that are generated by the BCPL plant are dumped in the Sessa river which polluted the river as well as the fishes which are found in the river eventually deteriorating the quality and even the quality of the fishes. In an interview conducted by the researcher the people living in the nearby village reported that they are grossly affected by the negative consequences after commissioning of the plant. They opined that not only their source of income, but their health is also affected by the emissions caused by the plant pushing them to meet unseen fate and future.

10.2.2.5 Impact on Health of the Marginalized Communities

The pollution of the river has a multidimensional affect on the lives of the people of bank residing area. The water pollution has not only affected their livelihood but also created severe health problems and diseases. The pollution caused by the BCPL has lead to severe health hazards and diseases. Contagious health diseases are in rise in the villages which are the product of the pollution which the river is experiencing since the set-up and the functioning of the BCPL. It was also stressed that several people from the villages had psychological problems due to the fear of the loss of livelihood because the pollution in the rivers rendered fishing impossible. Thus, as far as health security is concerned for the least privileged who are the residents of the places near to the BCPL plant, the plant which is supposed to provide 'socio-economic' benefits, is largely lacking it and instead new and expensive medicines and way of life is being made essential for these people already in trouble and trauma⁸.



⁷ Development and Marginalisation: A study of the BCPL Plant, by POOJA SHARMA, Research Scholar, Department Of Political Science Dibrugarh University, Assam, India, Journal of Xi'an University of Architecture & Technology, ISSN No: 1006-7930, Volume XII, Issue IV, 2020, Page No: 2367

⁸ Development and Marginalisation: A study of the BCPL Plant, by POOJA SHARMA, Research Scholar, Department Of Political Science Dibrugarh University, Assam, India, Journal of Xi'an University of Architecture & Technology, ISSN No: 1006-7930, Volume XII, Issue IV, 2020, Page No: 2367

10.2.2.6 Impact on the Livestock

Livestock has a great importance for the marginalized rural poor who have no stable economic assets, deposits and investments. The rural people depend on livestock to meet with any type of unseen emergency like medical expenditure, educational requirements of children etc. Moreover, livestock work as a source of food. As the poverty ridden people of the rural areas can't afford to buy nutritional foods from the market, they completely depend on the livestock like cow, goat, pig and poultry for milk, butter, meat, egg. Moreover, livestock has also an immense importance for agriculture and cultivation as like most of the places in Assam also ploughing with cattles is done in large scale till today. It is important to mention here that pollution caused by the BCPL has not only impacted livelihood security of the people but also has a huge impact on the livestock. The domestic animals like cow, dog, goat, duck etc are getting affected due to the breathing of polluted air and consumption of water from the polluted Sessa River. Livestock are either falling sick or dying rapidly. Chickens and ducks are dying due to the foul environment created by the gases and other effluents being released by the BCPL as prior to it such problems had never arisen. These farmers were clearly depressed about the loss of income from the produce of these animals as well as the fact that they could no longer rely on such produce for their own diet.



The Brahmaputra Cracker and Polymer Limited's (BCPL) refutation on the alleged water pollution in Sessa River appears to be a mere eye wash as fish fau in particular had been badly affected by the pollutants discharged from the plant during past one and a half year. The inputs received from prime fish market of Daily Bazar in Tinsukia revealed that, traders of late stopped selling fishes from Sessa River which otherwise fetched very high prices for its famous Pabta (*Ompokbimaculatus*) and Chital (*Notopteruschitala*). These fishes, according to traders and consumers, have developed distasteful kerosene like odor with changes in the skin colorations and brightness. As most of the fish traders had refused to sell Sessa fish in the main market, the vendors from Dibrugarh sell these fishes in the outskirts of Tinsukia town even as quantity had dwindled from few quintals to mere 40-50 kg in an average that often surface in retail markets currently. After complains being poured from different quarters, a chemical research laboratory of repute carried out a 'prelimiry' water sampling alysis of Sessa River that contained effluent of BCPL plant and detected contamints of high proportions, told a scientist, on condition of anonymity.

(Source: Article on The Sentinel, dated: 20th Aug, 2021, <https://www.sentinelassam.com/news/toxic-water-affects-fishes-in-sessa-river/>, accessed on 10th Sep, 2021)

10.2.2.7 Initiatives taken by BCPL authority

The inhabitants constantly protested the BCPL and accused that it discharges the industrial waste directly into the Sessa river. So to combat pollution, BCPL initiated some measures. In conformity with the Pollution Control Board of Assam, a modern water treatment plant was set up to treat all effluents. Moreover, to enhance safety and reduce atmospheric emissions, safety valve outlets were connected to an integrated flare system, a gas detection system to ensure quick detection of gas leak ⁷.

10.2.2.8 Water quality of polluted stretches of Sessa River

The detail analytical data of the stretch of Sessa River at Sessa Tiniali near Sessa Bridge on NH-37, is presented further in table 230.

Table 230 River Water Quality Parameter

Sl.No.	Parameter	Sessa Bridge, NH-37 (May 2017)
1	D.O. (mg/l)	5.1
2	BOD (mg/l)	2.1
3	Fecal Coliform (MPN/100ml)	Nil
4	Total Coliform (MPN/100ml)	760

(Source: Water Quality Index, PCBA, 2017)

The above data indicates that the BOD value was found to be within permissible limit during the year 2017 at specific mentioned location of Sessa River. Since the river has good volume and discharge, it has the phenomenon of self-purification which is constantly taking place and hence no actions for rejuvenation of the mentioned river stretches of Brahmaputra River may be required.



Sessa River

10.2.3 THE BURHI DIHING RIVER

Dihing or Burhi Dihing (Dihong means wide river) is a large tributary, about 380 kilometres (240 mi) long, of the Brahmaputra River in Upper Assam in North-Eastern India. The river originates at 2,375 metres (7,792 ft) above sea level in the Eastern Himalayas (the Patkai Hills) in Arunachal Pradesh and passes through the Tinsukia district before entering Dibrugarh district from the east. The river meanders almost through middle of the district and confluences with the Brahmaputra at Dihingmukh. It has a drainage catchment of 2,465 km² spreading across in the districts of Dibrugarh and Tinsukia. The length and width of the plain are around 75 km and 40 km respectively within Dibrugarh district. Its watershed covers about 6,000 square kilometres (2,300 sq mi) The Dihing has created number of oxbow lakes in the area.

Its watershed receives about 300 cm average annual rainfall. The meandering Burhi Dihing River being migratory in nature has created a number of abandoned channels, swamps on its either banks. This plain is prone to floods causing havoc due to overflowing of water from the Burhi Dihing or its tributaries and inundation caused due to spillage of water in the confluence of this river and Brahmaputra. This flat and low-lying plain is littered with areas of paddy cultivation, forests, and wetlands, while the higher areas are occupied by tea plantations and human settlement.

The Burhi Dihing meanders through the plains facing Patkai Hills for a length of 50 kilometres and then enters into Joypur-Digboi low hill range. It then comes out near Joypur to flow through the plains for a length of 120 kilometres and ultimately joins the Brahmaputra at about 32 km south-west of Dibrugarh town. At the later stage in its course, Burhi Dihing acts as a divider between Dibrugarh and Sivasagar districts. There is a presence of a number of ox-bow lakes in the area of flow of the river. The Disam is an important tributary of the Dihing in the southern bank of the river. The Dihing River provides a unique landscape of bamboo orchards, wet paddy fields, tea gardens, and natural scenic beauty. The tributary serves as a source of livelihood for people living along its banks.





Burhi Dihing River, Horey'ghat Bridge

10.2.3.1 Polluted River Stretch

No stretch of Burhi Dihing river is found polluted within Dibrugarh master plan area, however the length of the polluted stretch of Burhi Dihing river at Margherita is 2.7 km (approx.) with an area of 7.7 sq.km. The stretch identified as polluted is from Niz Makum Gaon to Lagun Gaon No. 1 & No. 2 for Burhi Dihing river at Margherita.

10.2.3.2 Identification of Major Locality around riverbank

Dibrugarh is one of the major towns located on the bank of the Burhi Dihing River. The approximate population of the Dibrugarh town is 1.54 lakh as per Census 2011. The major localities identified in and around the catchment areas of polluted stretch of Burhi Dihing River are Duliajan OIL town, Hatigarh Block, 1 No. Dulia, 2 No. Dulia, Rangajan No. 1, Bordubi No.1 and Sarupathar Bengali. As per Census 2011, the approximate population is 40,356.

10.2.3.3 Quantity of Sewage generated

There are no existing STPs located around the bank of Burhi Dihing within MPA.

10.2.3.4 Sewerage Treatment Proposal

As per the survey done, one (01) number of STP has been proposed at Duliajan. However, the sewage generation from the other villages are minimal and hence the untreated sewage can be taken care of by adopting stringent remedial actions.

Table 231 Sewerage Generation Calculation

Sl. No.	Area	Population	Water Consumption (KLD)	Sewage Generation (KLD)	No. of STPs proposed	Existing Treatment capacity (KLD)	Gaps in KLD
1.	Intake point of OIL, Duliajan & d/s of Burhi Dihing at Tinsukia and Dibrugarh	40,356	5448	4358.4	01	Nil	4358.4

(Source: Action plan for Burhi Dihing river, PCB, Assam)

10.2.3.5 Water quality of polluted stretches of Burhi Dihing River

The change in the water quality of Burhi Dihing in terms of BOD value in mg/l of Burhi Dihing at intake point of OIL, Duliajan, Tinsukia for the period 2016-2019 is presented below:

Table 232 River Water Quality Parameter

Sl. No.	Parameter	Value
1	B.D.O. (mg/L)- 2016	0.6
2	B.D.O. (mg/L)- 2017	3.3
3	B.D.O. (mg/L)- 2018	24
4	B.D.O. (mg/L)- 2019	1.0

(Source: PCB, Dibrugarh, 2020, Assam)

The above data indicated that BOD value has increased in only five (04) occasions out of forty (40) occasions at polluted stretch of Burhi Dihing at Duliajan, Dibrugarh. The increase of BOD load which indicates organic load may be due to draining of storm runoff along with the organic waste originating from domestic household waste into the river through the drains. The marginal increase of BOD level during dry period may probably be due to decomposition and high concentration of organic matter as their rate of dilution is very low due to lean flow of the river. Moreover, Assam is cursed with the catastrophic flood every year and hence this incidental exceedance of BOD value may be due to additional organic matter introduced in the river as a result of continuous rainfall during this disastrous calamity. This marginal and occasional exceedance of BOD level does not reflect the extremity of pollution. Hence this can be considered as incidental and can be omitted from the polluted river stretch.

10.2.3.6 Drains contributing to pollution

No Drains identified carrying industrial waste as well domestic waste directly to Burhi Dihing river within the Boundary of MPA.

10.2.3.7 Ground Water Quality

the quality of ground water in the Dibrugarh district is suitable for both the drinking and irrigation purposes.

10.2.4 WASTE MANAGEMENT PLAN

Table 233 Waste Management Plan

Sr. no.	Type	Status	Proposed actions	Authority
1	Industrial Waste	<ul style="list-style-type: none"> No industrial waste dumped on land or discharged into water bodies/river. Industrial wastes are managed by industries itself. Authorisation have been granted to different industries in line with Water act 1974, Hazardous Waste (Management, Handling and Transboundary Movement) Rule, 2008 as amended. Regular monitoring by PCBA to ensure that the terms and conditions are strictly adhered in accordance with the prescribed standard 	Direction issued to the industries to identify the non-point sources and arrest contamination of storm water.	Pollution Control Board Assam
2	Municipal waste	<p>a) Municipal Body has engaged NGOs ward wise for collection of Municipal Solid Waste from the generation point for treatment and disposal.</p> <p>b) The wastes are being segregated into dry and wet waste categories and are collected separately and transported to treatment and disposal site.</p>	<p>Municipal Body is in process of inducting the following activity</p> <ul style="list-style-type: none"> Implementation of segregation of waste at source Door-to-door garbage Collection of waste Formation of Sanitation task Force Formation of Neighbourhood Community Awareness campaigns Processing and disposal of waste 	Municipal Body
3	Plastic Waste	<ul style="list-style-type: none"> At present plastic wastes are being dumped along with Municipal solid waste. Lack of unscientific disposal facilities/ infrastructure technology like decentralized composting or bio-methanation plant, waste to energy plant, solid waste management plant. 	Letter is being issued intermittently by PCBA to Municipal Board to segregate and collect plastic waste and initiate necessary steps to channelize the waste to authorized agencies for recycling and reprocessing	Municipal Body/Pollution Control Board Assam
4	Hazardous Waste	<ul style="list-style-type: none"> No hazardous wastes are directly disposed in the river 	Awareness campaign regarding health and other issues related to Hazardous waste	Pollution Control Board Assam
5	Biomedical Waste	<ul style="list-style-type: none"> Segregation at the source under Biomedical waste Management Rules, 1998 as amended The HCFs have installed ETP for treatment of liquid waste generated 	Direction issued to all HCF unit to implement the BMW Rules, 2016 as ammended in all HCF Units. (As per guidelines of CPCB)	HCF units/ Pollution Control Board Assam
6	E-waste	<ul style="list-style-type: none"> Annual return in (Form-3) is submitted by E-Waste generating units to PCBA from time to time for onwards transmission to CPCB There is no authorised recycler, refurbisher, dismantler etc. available to ensure environmentally sound management of E-waste. 	Few entrepreneur approached PCBA for registration and authorisation as Recycler	Pollution Control Board Assam

(Source: Pollution Control Board, Dibrugarh, Assam)

10.2.5 PROPOSED STRATEGIES FOR RIVER

10.2.5.1 Key elements to encounter

- Slum Settlement around the river
- Polluted drains contributing to the river
- Solid waste dumping around river

The conservation of the River is an important goal for the Dibrugarh town. To achieve this goal, in a sustainable manner, several actions are necessary. These actions focus on addressing pollution from the major sources – raw domestic sewage and MSW – and improving the hydraulic conditions. Actions are also proposed to provide human use benefits for the citizens of Dibrugarh. By providing these benefits, and connecting people to an improved waterway, the stewardship of the river can be shared by all and achieve lasting conservation success

10.2.5.2 Proposed Actions that Comprise the Restoration Solution

To remain consistent with the framework, the proposed actions which comprise the restoration of the River and its drains include:

- Greenery Development – Plantation plan
- Sewage collection and treatment.
- Setting of Effluent Treatment Plant
- Solid waste collection and management.
- Hydraulic improvement (including uptake of water from the Brahmaputra River)
- Improving hygiene and sanitation conditions.
- Community access and benefits.
- Setting of monitoring system.

Each of these actions is described in more detail further:

- **Greenery Development – Plantation plan:** State Government has initiated afforestation in the degraded forestland, also raising roadside plantation besides creating check dams/embankments in the river catchment areas to combat erosion and soil conservation. The following remedial actions has to be initiated in consideration of greenery development.
 1. Raise plantation along the riverbank to control the flow runoff water directly to the river.
 2. Bamboo species to be raised as it is a good soil binder thereby stabilize the banks of the river from erosion.
- **Sewerage collection and treatment:** Presently there is no centralised sewerage collection and treatment facility in Dibrugarh largely because most households have either a septic tank or soak pit. A new sewage collection system is proposed to collect all sewage and transport it to a centralised place for treatment. The system, if properly implemented, will significantly reduce pollution loads to the river. Another option which may be considered is to have multiple decentralized STPs located at strategic locations throughout the catchment area. This option will be evaluated in the Feasibility Report.
- **Setting of Effluent Treatment Plant:** It should be observed that none of the small-scale units of the identified polluted stretch discharge their effluent directly into the river stretch as they have to captive

ETP for treatment of their effluent. Moreover, the Board has to issue direction to build their own set up in their premises which do not have STP/ETP.

- **Solid waste collection and management:** Dibrugarh town has newly functioning solid waste collection and management plan, it is an Integrated Solid Waste Management Plan for the catchment area, which will also cover the entire town. As the town will implement a MSW collection and management system, waste will be collected from primary and secondary locations, and transported off-site to a disposal or reclamation facility. Initially this system will require some years to become effective as the population learns to use and value the system over current litter and dumping practices.
- **Hydraulic improvements:** Regular flooding of the Dibrugarh town due to Brahmaputra River in the past has resulted in closer connectivity of the Sessa River with the Brahmaputra River by the water resources department. This has resulted in less flow in the Sessa River.
- **Improving hygiene and sanitation conditions:** A number of community toilet complexes are required in slum area along the river. Solid waste collection bins and proper washing and bathing facilities are required at slums along the river.
- **Community access and benefits:** One of the keys to river conservation success is to provide human connections to the waterway. When these connections are established, everyone becomes a steward of the river and the restoration will be more likely to succeed. Examples of community benefits include the establishment of greenways along the waterfront and points of interest to educate the community on conservation features and ecological resources.
- **Setting of monitoring systems:** An on-line system can be designed and proposed to be implemented to monitor the water flow as well as water quality of the Brahmaputra River system. The on-line information will be used by decision makers to avoid flooding in the town.

10.2.5.3 Treatment and Disposal of Septage

Some of the households in the towns are equipped with ordinary septic tanks. Under the Swachh Bharat Abhiyan, Public Health Engineering has constructed 5893 numbers of IHHL in the Dibrugarh district to attain open defecation free status. Moreover, public toilets have also been constructed at the commercial areas.

Following remedial actions will be taken in consideration of treatment and disposal of sewage

- Sewage Treatment plant should be installed for treatment
- The discharge should be trapped by strainers before draining off to the river.
- Every individual households should be connected to sewer lines.
- Every households should be recommended to have individual drainage that should be connected to soak pits or stagnated pool.
- Roadside hotels/restaurants should not be allowed to dispose untreated sewage and solid waste into the nearby drains or rivers. These establishments should be properly regulated by the concerned authority.
- Public awareness to control open defecation and understand the sanitary hygiene.
- Local administration should provide proper pucca toilets for the individuals or atleast community toilets through the IHHL scheme under Swachh Bharat Mission.

10.3 JOKAI RESERVE FOREST

Located around 12 km away Dibrugarh Town on the Mancotta-Khamtighat road, the Jokai Botanical Garden cum Germplasm Center is a protected biodiversity forest area.

Dibrugarh being heavily rain fed boasts of wet evergreen forests, tropical moist deciduous forest, canebrakes and grasslands. They support a wide variety of flora and fauna, many of which are highly endangered. The Jokai Reserve Forest,



Jokai Reserve Forest and Botanical Garden

Butterfly Breeding on Flower



located around 12 kilometres away from the Chowkidinghee Chariali point, happens to be the natural habitat for a number of flora and fauna, with variations strictly marking from a wide variety of monkeys to different species of deer, wild cats, hornbills, cranes, storks, woodpeckers and kingfishers. The forest has an area of 23.08 sq.km., and it has within it the Jokai Botanical Garden cum Germplasm Center. As a result of a massive thunderstorm and lightning, a large number of trees and vegetation of the Botanical Garden got uprooted, absolutely devastated and totally exterminated forever. It has yet not been possible to replenish the tremendous loss of greenery and vegetation; such has been the magnitude of the loss, suffered

by the Jokai Reserve Forest, owing to natural disasters and calamities.

The Dibrugarh Forest Division – which had initiated an eco-tourism project adjacent to the Jokai Botanical Garden and Germplasm Centre in the Jokai Reserve Forest which is only 15 kms from Dibrugarh town and within Master Plan Area 2045. The Dibrugarh Forest Division, the Northeast Council (NEC) had financed a project which has been christened as the Jokai Botanical Garden Development and Ecotourism Project.

The Jokai Reserve Forest had been a rich treasure trove of various species of flora and fauna which included some important species which are nearly extinct now. Besides, the reserve forest is also home to various types of butterflies. Some of the commonly found animals are the Assamese macaque, leopards, elephants, deer, and wild buffaloes, slow loris, civet cats, etc. Jokai which houses a lot of fruit bearing trees attracts a large number of migratory birds every year and around 100 species of these migratory along with residential birds had been recorded in the reserve forest. Moreover, there are around 17 species of reptiles present here.

There is a huge water body – which is known as Erashuti – attached to the reserve forest is also home to various types of indigenous fishes, turtles, etc. and the forest department has plans now to introduce boating in these water bodies.

The department will construct eco-huts in and around the Erashuti to house tourists who want to spend time in the ambience of nature. The eco-huts will be built in a traditional way using materials like bamboo, timber, thatch etc, some cementing work will be done keeping in view the comfort level of the tourists, however, the general look will be completely traditional.

10.4 WIND DIRECTION

In Dibrugarh region, the wind direction is not the same throughout the year. It changes from season to season. Over Dibrugarh, the wind will be from either North or Northwest during monsoon season, i.e., June to September. It will be from northeast during Northeast monsoon season, i.e., October to December. When western winds are weak (particularly during south west season) northern mountain breeze over rides and blows from the North in the afternoon timings on most of the days. During northeast monsoon season the mountain forest breeze strengthens the already prevailing easterly winds. Thus, easterly winds blow most of the days in a year particularly in the afternoon.

The diagram for Dibrugarh shows the days per month, during which the wind reaches a certain speed and the monsoon creates steady strong winds from December to April, and calm winds from June to October.

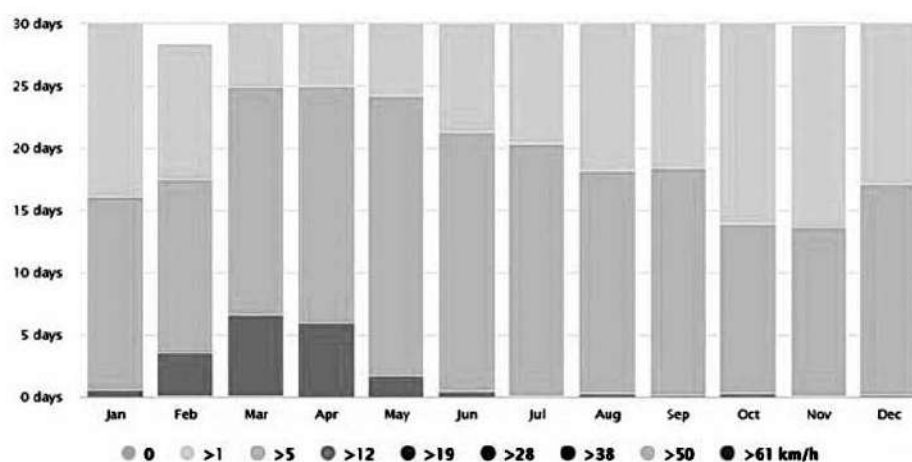


Figure 169 Monthly Wind Speed Diagram

The Wind Rose diagram of Dibrugarh shows how many hours per year the wind blows from the indicated direction.

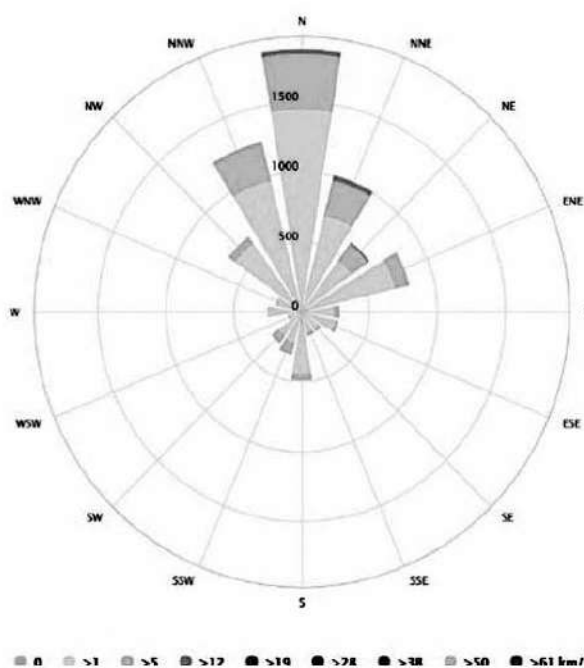


Figure 170 Wind Rose Diagram

10.5 GROUND WATER

The region is a part of Brahmaputra River basin. The area is drained by Brahmaputra River and its tributaries. Important tributaries of Brahmaputra River are Burhi Dihing, Dibru, and Sessa. All these tributaries are pereminal and are highly meandering. The lower order streams present a dendritic pattern, but higher older streams show a subparallel pattern. Majority portion of the people of the region are either agriculturists or engaged in related activities. Paddy is the dominant crop of this area and is grown in low land area while high land supports a good number of tea gardens. Other crops of the district are gram, tur, Mesta, mustard etc.

Ground water occurs in these formations both water table as well as confined conditions and is being developed by dug wells, dug-cum-bore wells and tube wells. The main aquifers that contribute ground water in Dibrugarh are a) Alluvial Aquifer b) Cuddalore sandstone

The district is occupied with two different landforms namely

(1) Flood plain of Brahmaputra River

Flood plains: The alluvial flood plains occupying the maximum part of the district is almost flat, except gentle undulations at places. Land elevation of the land ranges between 86.88 m and 152 m AMSL. General slope is towards west and southwest.

(2) The terrace deposits and denudational hills in the southern part.

The terrace deposits and denudational hills: This present in the south-eastern part of the district, range in elevation from 115 to 350m AMSL and rise upto 500m AMSL in Tikak Parbat area. The regional trend of the hills is NE-SW.

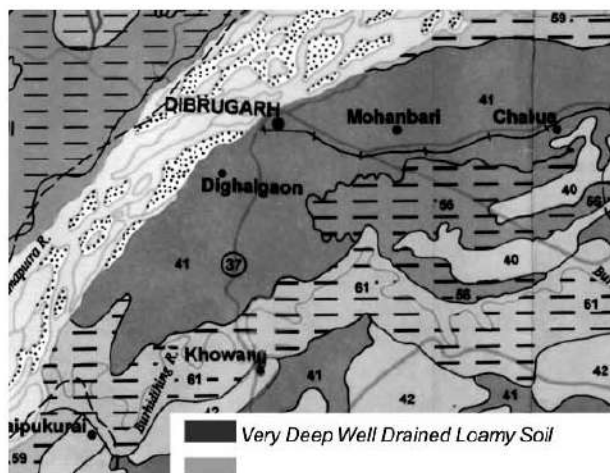


Figure 171 Soil Map of Dibrugarh Region

Table 234 Existing Ground Water condition

Block	Premonsoon depth to water (in m bgl)	Postmonsoon depth to water (in m bgl)	Flood plain/Area traverses by major rivers
Borboruah	0.90 to 1.79	1.27 to 2.20	Brahmaputra River: Flowing in the extreme North (flowing from NE to SW) Sessa River: Flowing through the central part of the block, flowing from NE to SW. Burhi Dihing River: Flowing in the southern boundary of the block, flowing from NE to SW
Lahoal	0.30 to 0.86	1.06 to 2.64	Brahmaputra River: Flowing in the extreme Northern part of the block Mai Jan River: Flowing in the northern part of the block (flowing from East to West) Dibru River: Flowing from NE to SW and meets with Brahmaputra River in the West

The water table contour ranges in elevation from 97 m AMSL in western part to 113 m AMSL in the eastern part. The gradient varies between 0.30 to 0.55 m/km. Seasonal fluctuation in most part of the district is within 1 to 2 m. But, along the BurhiDihing river and Brahmaputra river, the fluctuation is less than 1m. In semi-

consolidated Tertiary formation, water level fluctuation is 2 to 4 m. The piezometric surface rests between 1.25 and 4 m BGL. A number of shallow bamboo tubewells constructed in this district down to a depth of 36 m by tabbing 12 to 15 m of saturated medium to coarse grained sand zone. Yield of these wells varies from 27 to 31.5 m³/ hour. Deep tube wells constructed down to 253 m bgl yield around 82 - 164 m³ / hour for a nominal drawdown of 2 - 3 m. Transmissivity in the area ranges from 6,500 to 10,350 m² /day. Storage coefficient ranges from 2.57 X 10⁻³ while specific capacity ranges from 798 to 915.

- Net Ground Water Availability = 1794.65 mcm
- Gross Ground Water Draft = 266.76 mcm
- Stage of Ground Water Development = 15%
- Future provision for Domestic & Industrial Use = 37.45 mcm
- Future Provision for Irrigation Use = 1519.49 mcm

(Source: Ground Water Information Booklet Dibrugarh District, Assam, 2013)

10.6 POLLUTION

10.6.1 WATER POLLUTION

Surface water quality has been monitored at different locations viz. Bogibeel, Near Sessa NH Tiniali and Maijanganhat for Brahmaputra and Burhi Dihing river. The observation data for last two years i.e. 2018 and 2019 are within the prescribed limit for surface water standards.

The PCB Assam had conducted the below survey of surface water quality monitoring on monthly and ground water quality on monitoring on half yearly basis under National Water Monitoring Program (NWMP) at different location in Dibrugarh district. BOD Standards observed within standard limits in major duration of year (Not above 3).

Table 235 Water Pollution in River

Source	Year	BOD Level		Fecal Coliform		Total Coliform	
		(Min-Max)	(Mean)	(Min-Max)	(Mean)	(Min-Max)	(Mean)
Brahmaputra river at Maijanganhat	2017	0.9 - 3.0	1.8	Nil - 21000	3203	Nil - 2800	781
	2018	0.7 - 2.5	1.6	Nil - 2900	1163	Nil - 1500	711
	2019	1.1 - 2.2	1.7	300 - 1100	443	360 - 4300	1400
Sessa river near Sessa Tiniali, NH bridge, Dibrugarh	2017	1.6 - 2.4	1.9	Nil - 910	635	Nil - 1500	1068
	2018	1.3 - 3.2	2.1	Nil - 2100	1025	Nil - 2100	1147
	2019	1.2 - 2.2	1.7	Nil - 1500	747	Nil - 3500	2020
Brahmaputra River at Bogibeel Bridge Bogibeel, Dibrugarh	2017	1.2 - 3.6	2.3	Nil - 730	545	Nil - 730	582
	2018	1.0 - 2.0	1.5	Nil - 2000	671	Nil - 2800	1373
	2019	1.0 - 2.3	1.7	Nil - 920	394	Nil - 2700	1312
Bor Beel at Jakai, Assam	2017	2.2 - 18.1	5.4	Nil - 2100	649	360 - 29000	3680
	2018	2.1 - 10.0	5.1	Nil - 3500	1254	360 - 24000	3846
	2019	1.3 - 4.5	2.7	Nil - 1100	624	300 - 3500	1752
Ground water from Niz-Kodomonni PWSS Complex, Dibrugarh	2017	0.8 - 2.6	1.6	Nil - 730	515	Nil - 2000	1470
	2018	2.0 - 2.7	2.4	Nil - 360	360	Nil - 360	360
	2019	1.2 - 1.3	1.2	Nil	Nil	Nil	Nil

(Source: Regional Office, PCB, Dibrugarh, Assam, 2020)

10.6.2 LAND POLLUTION

Land is one of the most important and limited resource and it is directly or indirectly linked to most of the sectors like industrial, agricultural, residential etc. Improper drainage of water and water logging apart from polluting water resources has degraded land as well. Its degradation will directly affect the agricultural activities and ground water quality. Once ground water quality is affected, it will affect the water supply of the planning area since Planning Area is predominantly depended on ground



Water Flooded Area near Patra Gaon

water. In certain areas of the planning area like Patra Gaon has led to loss of fertile topsoil. This has degraded the land to a large extent in terms of agricultural use. The Patra Gaon area in the west of DMPA, is low lying area where most of time during monsoon season it gets flooded by flashflood water from Brahmaputra river.

10.6.3 NOISE POLLUTION

Noise level recorder within Planning Area during 2017 and 2019 at different locations are mentioned below in table 235.

Table 236 Existing Noise Standards

Year of Monitoring	Milan Nagar (Residential) dB		Maruwaripatty, Dibrugarh (Commercial) dB		Assam Medical College & Hospital (Silence) dB	
	Before Deepavali	After Deepavali	Before Deepavali	After Deepavali	Before Deepavali	After Deepavali
2017	57.3	63.2	61.2	86.0	50.7	61.5
2019	58.0	77.0	62.0	87.0	50.0	62.0

(Source: Regional Office, PCB, Dibrugarh, Assam, 2020)

10.6.4 AIR POLLUTION

Pollution Control Board is monitoring ambient air quality at the following three air Quality monitoring stations in Region under National Air Monitoring Program (NAMP) at one location in residential area at Dibrugarh Town (Dibrugarh Regional office Building, Chowkidingee,) has been measuring SO₂, NO₂, PM₁₀. The pollutant assessed are Suspended Particulate Matter, Particulate Matter of size less than 10 µm, Sulphur-di-oxide (SO₂) and Nitrogen di oxide (NO₂). The table below depicts the result of these four parameters. The yearly average values of these parameters from 2017 to 2019 are mentioned in table below.

Table 237 Air Quality Standards Recorded

Type of pollutants	Residential Area		
	2017	2018	2019
SO ₂ (ug/m ³)	7	6	5
NO ₂ (ug/m ³)	16	12	11
PM ₁₀ (ug/m ³)	58	54	36

(Source: Regional Office, PCB, Dibrugarh, Assam, 2020)

As it is seen from the above table, the annual average concentrations of the pollutants in all the three Air Quality monitoring locations are within the prescribed standard limits.

10.7 ENVIRONMENTAL STRATEGIES

10.7.1 PROTECTION OF WATER CHANNELS

Protection/conservation of water channels is as much important as preserving a lake as these are the main channels, which brings water to the waterbody. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds. Stream systems have been classified according to their relative position within a stream network in order to understand, discuss, and explore similarities and differences between them. Many stream order classification systems have been developed, but no single system has been universally accepted. One of the earliest methods developed, and arguably the most commonly used method today, was developed by Strahler in 1952. In this system, the smallest head-water tributaries are called first-order streams. Where two first-order streams meet, a second-order stream is created; where two second-order streams meet, a third-order stream is created; and so on.

The major/important water channels with their orders are identified and the identified primary, secondary and tertiary water channels are given a buffer. The buffer zone for water bodies are categorized according to proposed planning strategy. The detail of the buffers are given in the proposed strategy.

In this buffer zone, regulated development is allowed. Protecting the drains will ultimately provide a smooth drainage in the area reducing the risk of flooding and water logging, ensuring uninterrupted flow of water to the waterbody. Other than this, detailed Environmental Management Plan has to be prepared which extensively studies the environmental parameters of the region. Under which numerous proposals can be developed. One of them can be identification of various catchments where the ground water recharge can take place. A concept of green infrastructure can also be adopted. At the site scale, different green infrastructure proposals consisting of site-specific management practices (such as interconnected natural areas) that are designed to maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls can be introduced.

10.7.2 PROTECTION OF FOREST AND MANGROVES

Mangrove forests are among the most threatened habitats in the world. They may be disappearing more quickly than inland tropical rainforests, and so far, with little public notice. Conservation of mangroves is important due to its various benefits like, It Protects the land from erosion

- Acts as an important natural shield against natural disasters like cyclones, ecological
- Disasters etc.
- Good source of timber, fuel and fodder
- Saves the marine diversity
- Purifies the water by absorbing impurities and harmful heavy metals
- Potential source of tourism and recreation



Figure 172 Jokai Reserve Forest

10.7.3 SUMMARY OF ENVIRONMENTAL STRATEGIES

- The south bank of Brahmaputra River which falls under Master Plan area should be protected as special area upto 50 mt for Public realm and recreational spaces.
- The north bank of Burhi Dihing River falls under DMPA should be protected from urban settlement and need to be utilized as Organic farming and recreational spaces.
- The water bodies (ponds/Lakes) outside the conurbation area should follow the 30m buffer from the edge of the water body boundary.
- The Sessa river stretch which fall under the DMPA should have the 15 m buffer on both the sides.
- There is a lack of green spaces/recreational area in the planning area. Thus, after the detail study the city level and neighbourhood level parks/playgrounds are proposed.
- Tea Gardens are the traditional farming activity observed in the Planning Area, hence this area will be preserved by declaring agricultural zone under Master Plan -2045 and Regulated Development will be allowed in certain parts of this area.

10.7.4 RECREATIONAL ACTIVITIES AROUND RIVER

- River Front Development
- Jogging trails around the Water Body
- Water sports activities

River Front Development

- Design, development adjacent to natural features in a sensitive manner to highlight and complement the natural environment in areas designated for development;
- Integrate development on river fronts with the natural environment to preserve and enhance views, and protect areas of natural drainage;
- Minimize grading to maintain the natural topography, while contouring any landform alterations to blend into the natural terrain;
- Screen development adjacent to natural features as appropriate so that development does not appear visually intrusive, or interfere with the experience within the open space system. The provision of enhanced landscaping adjacent to natural features could be used to soften the appearance of or buffer



development from the natural features;

- Use building and landscape materials that blend with and do not create visual or other conflicts with the natural environment;
- Design and site buildings to permit visual and physical access to the natural features from the public right-of-way.

Jogging trails around waterbody

Jogging trails are popular for bird viewing, walking, bike riding and other outdoor activities. Land managers often design and maintain trails in expansive public use areas. There is increasing interest from homeowners, business owners, wildlife enterprise entrepreneurs, schoolteachers, boy scouts, hospital personnel, parks department staff and others to develop and maintain nature trails on smaller landholdings.

Nature trails can be designed to minimize human disturbance and impacts on wildlife, plants, soils, and waterways. A well-designed trail can aid in land management, such as through simplifying timber evaluations or creating fire breaks. Properly built trails also provide opportunities to teach youngsters about wildlife, forestry, and natural resources.

To reduce impacts of trails and trail users on wildlife and plants, best trail practices are:

- Align trails along or near existing human-created edges or natural edges rather than bisecting undisturbed areas.
- Keep a trail and its zone of influence away from specific areas of known sensitive species.
- Avoid or limit access to critical habitat patches.
- Provide diverse trail experiences so that trail users are less inclined to create trails of their own.
- Use spur trails or dead-end trails to provide access to sensitive areas because these trails have less volume.
- Generally, concentrate activity along trails rather than disperse it.
- Keep trail construction impact as narrow as possible.
- Concentrate weed control at road and trail crossings, trailheads, and riparian areas



Nature Friendly Jogging Track

Water Sport Activities

Water Sport Complex could be identified on suitable river frontage area where water Sport activities like boating, Jet ski, riding could be promoted for public recreational activities.





11 SPATIAL STRATEGY AND LANDUSE PLANNING

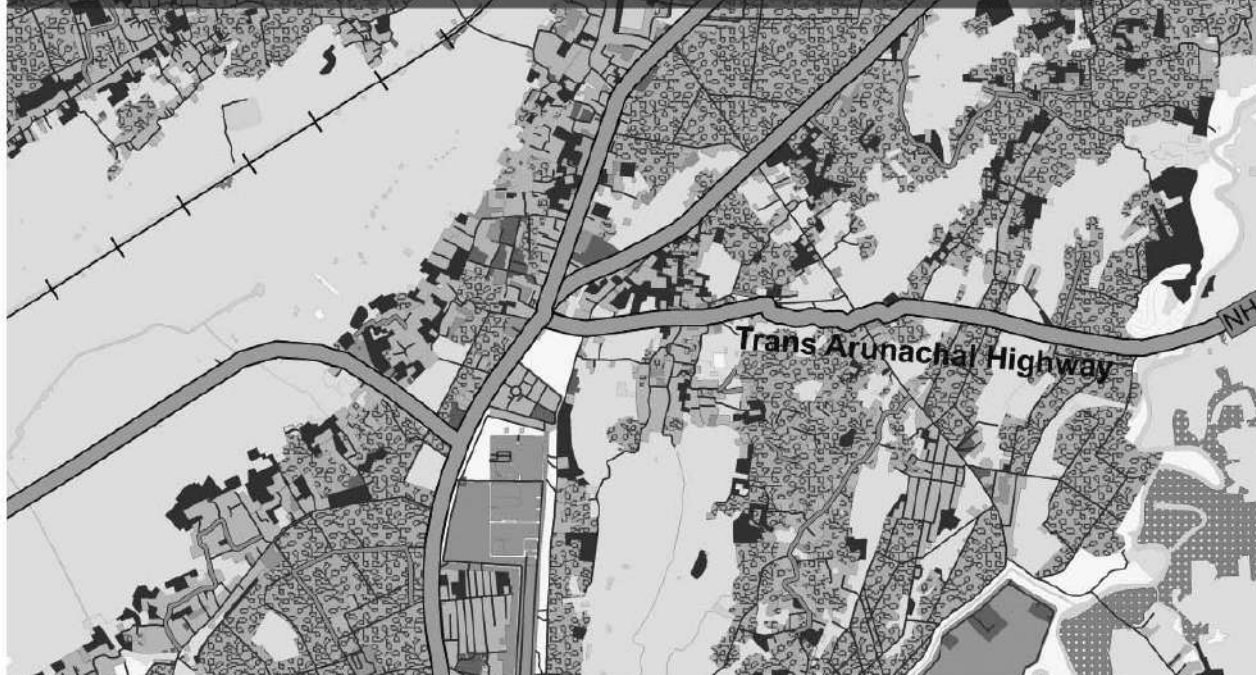
11.1 APPROACH TO URBAN PLANNING

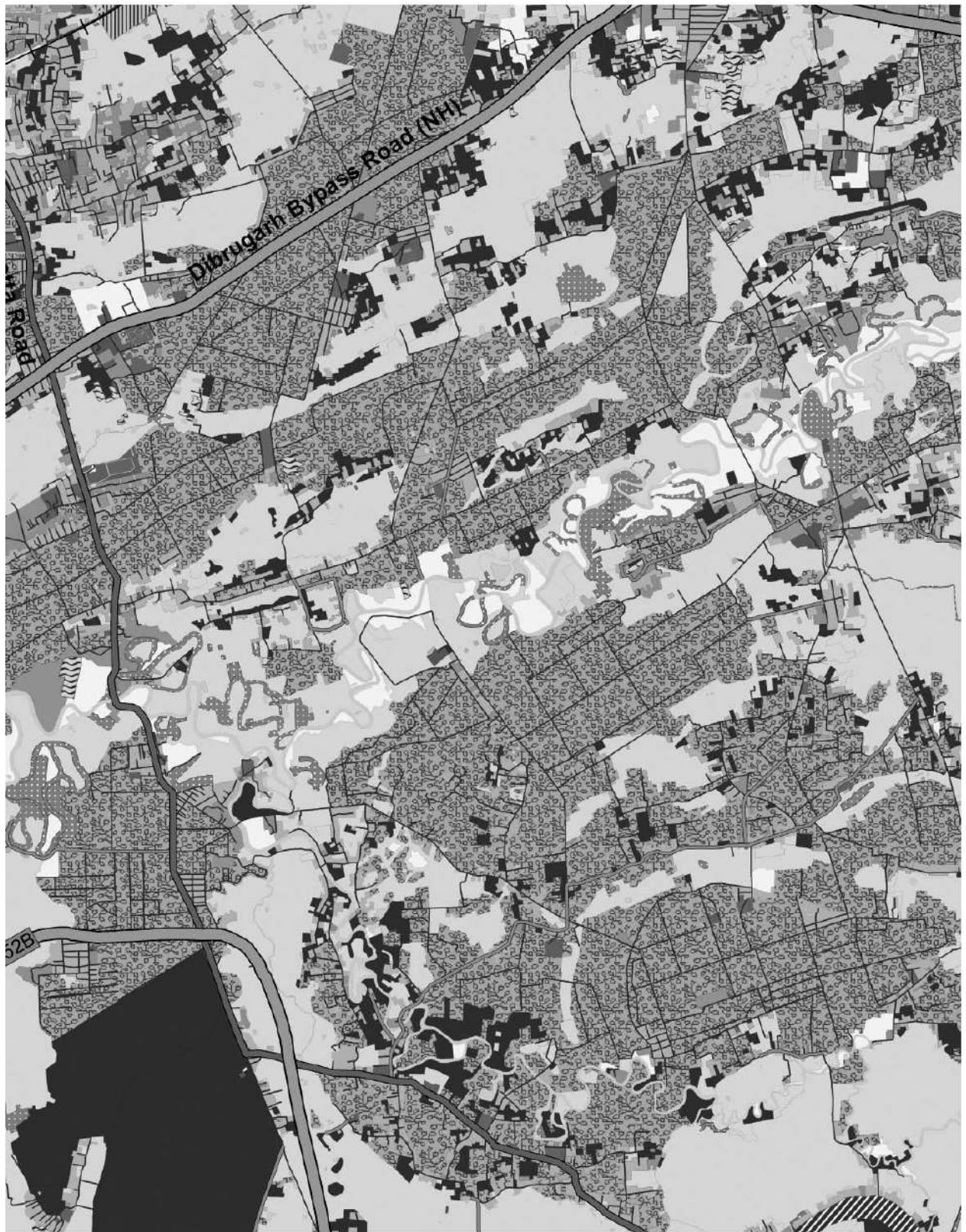
The objective of preparing a Master Plan for the Dibrugarh is to integrate the functions of DMB as a cohesive entity with the rest of the planning area. The region excluding DMB is largely depends on the core municipal area to sustain. DMB provides the necessary impetus and drive for the development of conurbation and rural area. Development of the Dibrugarh is critical for development of the entire northern district of Assam and as a Gateway to Arunachal Pradesh. Therefore, it is required to understand the issues of the area surrounding the Dibrugarh city so that the entire DMPA is fully integrated.

Urban planning refers to the rational and judicious approach of allocating available land resources to different land using activities and for different functions consistent with the overall development vision / goal of a particular region. The main objectives of land use planning area

1. To promote efficient utilization and disposition of land ensure the highest and best use of land.
2. To promote desirable pattern of land uses to prevent wasteful development.
3. To preserve areas of ecological, aesthetic, historical and cultural significance.

In the chapter, it details out the visions, goals & planning concepts adopted for the preparation of GIS Based Master Plan for Dibrugarh Planning Area-2045. It then presents the guiding principles and strategies adopted for various sectors and the applications of planning theories & techniques. Later on, in the chapter it elaborates the Land use policies & growth centre models adopted. The chapter concludes a detailed explanation of the concept plan for the planning area prepared based on the strategies to achieve the overall visions & goals.





11.2 EMERGING CONCERNS AND ISSUES

However, though its strategic location, Dibrugarh as a whole is lagging behind the rest of the country. Flood and water logging are the main reasons that the region has not been able to come up to a certain standard of all-round development, particularly in the countryside. Apart from that, there are many other issues affecting the growth of the region, such as, weak infrastructure, and exhausted and congested CBD area, narrow accessible carriage ways encroached by unorganised parking stretches in the city core area. Following are the main emerging concerns and issues in the project area:

- Flood and Water Logging- Flood and water logging have been a major concern for the region since 1950. During the last almost six decades, this problem has devastated the urban and rural economy of the region in a big way. Water level of the Brahmaputra River, inadequate drainage system, informal settlements, and lack of solid waste management are the main reasons for flooding and water logging in the region.
- Flowing river like Brahmaputra would have low pollution level; however, the river in the project area is polluted because of the raw sewage directly discharged into the river without any treatments. In addition, a vast portion of the municipal waste flows directly into the river through its tributary rivers. Due to lack of efficient solid waste disposal mechanisms, people have a tendency to throw plastics and other garbage into the open drainage, which leads to clogged drains.
- Existing quality of roads in the region is extremely poor; on top of that, the encroachment on the roads has narrowed the streets, which is causing the traffic chaos. Not even the national highways passing through the region is four lane. The collector roads and streets of markets and narrow and lack of sufficient parking area. All these are creating traffic congestions in and around the city area.
- Neither artificial nor natural drains have the capacity to carry the storm water effectively. Additionally, untreated wastewater from residential, commercial, and industrial activities is discharged into the underground and open drains.
- Haphazard Development- throughout the region, number of illegal construction, encroachments on the pedestrian pathways and wetland, and violation of Byelaws have led to imbalanced built-open relationship.

11.3 VISION, GOAL AND OBJECTIVES

The Dibrugarh GIS Based Master Plan - 2045 is initiated with the aim of achieving a better economic growth, better infrastructure facilities, and higher quality of life for the planning area while keeping the heritage, culture and form of the city intact and preserving the environment of the area. To achieve these, it is essential to set out goals and adopt the planning concepts and guiding principles so as to ensure maximum benefits and least adverse effects. The discontinues & non-homogenous geographical profile of the planning area which is a historical accident has thrown several challenges towards ensuring continuity and proper planned development. Despite this limitation, through forethoughts & reasonable approach to the situation desired results could be achieved. This section elaborates the vision statement, goals that are formulated to achieve the goals and the planning concepts, which will guide to achieve the same.

11.3.1 VISION

The Vision for the planning area perceived around the following core ideas:

- Preserving our historical past, maintaining the livability of the present, and transforming our future through the implementation of the highest quality planning, to enhance the level of infrastructure service to all people of Dibrugarh Region.